PART 5

Time and space in the age of information

A governing trope to describe the effects of the ICT revolution and the dynamics of neoliberal globalisation which gave it its political and economic momentum is that of 'time–space compression'. David Harvey coined it in his 1989 book *The Condition of Postmodernity*, and deployed it to characterise what he saw as a defining feature of an evolving post-Fordist, postmodernity (pp. 240–242). Time–space compression, for Harvey, was the effect of a rigid social and economic system of industrialisation made (or forced to become) 'flexible'. This occurred through the dismantling of post-war Fordism beginning in the 1970s. Capitalism was then able to be true to its 'essence' and expand, relatively uncontrolled, to every corner of the earth in its historical project of globalisation. The effect was a rapid process of time–space compression where the world increasingly became (and continues to become) a smaller place, with social and cultural relations accelerating in synchrony with a fast-moving contemporary postmodernity.

Around the same time, Anthony Giddens, in *The Consequences of Modernity*, was developing a similar theory which was rooted more in sociology than Harvey's political economy. Giddens termed it 'time–space distantiation' (1990). Essentially, for Giddens, the concept means a *separation* – or what he called the 'disembedding' – of time and space from localised *place* and its local contexts of interaction. Through the communicative dynamism of modernity, social relations are stretched across time and space and social action is increasingly conducted beyond one's immediate physical presence (in space or place). For Giddens, these processes – made possible through advances in communications technologies – serve to 'empty out' localised space to create a one-world globalisation, a globalised space or 'a single world where none existed previously' (1990:27).

In media theory, and in the social sciences more generally, these authors, with their accounts of transformations in time and space through the increasingly complex and comprehensive processes of modernity and industrialism, have been influential. We choose not to reprint them here, however. This is because they are not about media theory per se, and also because they are widely available either in their original form or in the various readers in which extracts have been reproduced (e.g. Cassell, 1993; Lechner and Boli, 2000). They nonetheless are recommended texts for anyone wishing

to investigate more deeply the issues of time and space and how our experience of them can be transformed through technological innovation. They also provide an excellent context through which the following texts may be explored.

James Carey begins this final part by providing an historical context. The revolutionary new innovation of the 19th century, he argues, was the telegraph, a technology that 'ushered in the modern phase of history and determined, even to this day, the major lines of development of American communications'. Most important for Carey was that the telegraph 'marked the decisive separation of "transportation" and "communication", terms that hitherto had been synonymous. He argues that the 'media' of communication was transformed through this single technology. Not only did it infinitely accelerate the process of 'time–space compression' – which corresponded exactly with needs of an emerging industrialisation – but also 'reworked the nature of written language [telegraph meaning "to write at a distance"] and . . . the nature of awareness itself'. For Carey the telegraph was thus *ideological* in its import. It served to 'naturalize' the spread of capitalism and of modernity and functioned to internalise the 'rhetoric of the technological sublime' that underscored them both. Moreover, the spread of the telegraph, he argues, worked to rationalise the use of language into a mode more aligned to business and to science, 'disembedding' at the same time – to use Giddens's term – the subtleties and variation of regional, local and colloquial forms of language use.

The social, economic and cultural effects of the telegraph are considered in the extract from Jeremy Stein. The full essay focuses on the Canadian town of Cornwall, Ontario, from the time of the introduction of the telegraph in the 1860s. Here we reprint the preface to this discussion which is a useful observation on the various contemporary theories of 'time–space compression'. The fundamental question Stein asks is whether our experience of space and time is *revolutionised* by powerful new media technologies in the ways that theorists such as Harvey and Giddens would argue, or is the process more evolutionary? Like Carey's work, Stein's concentration on the historical context and the telegraphic media has powerful implications for contemporary theories of new media.

Nicola Green brings us up to the present with her essay 'On the move: technology, mobility, and the mediation of social time and space', which looks at the experience of time and space through the use of that most ubiquitous of new media technologies, the mobile phone. Green's work is important because it recognizes a unique convergence of technology use within time and space. For Green, the act of being 'mobile' and communicating across time and space represents a qualitatively different experience from that of other media technologies such as the telegraph, or television or the internet, where users are required, usually, to be fixed in space. Using qualitative data gathered from the experience of users themselves, she asks the crucial question: what does it mean to be mobile in a mobile world?

And it is from the relatively 'fixed' position of the online user that Lee and Liebenau, in the next extract, consider the temporality of the internet. What time is it on the internet, when the local times of users would span every time zone in the world? On the internet, they observe '9PM is no longer different from 8:17PM'. Instead of being unthinkingly dependent on the clock for our understanding of time, the notion of temporal 'duration', or our experience of the 'passing' of time or the 'time it takes' for a

particular task, takes on a new significance. They argue that the 'fiction' of real time is revealed through such a perspective, and that instead the internet generates its own times through the activities of its users. With such a potential for an awareness of duration, the 'fact' that it is 12:16PM or whatever, becomes increasingly less relevant on the internet and the inherently asynchronous 'lags' and 'cycles' and 'rhythms' of the network space become more pronounced.

In the last extract from Thomas Hylland Eriksen's *Tyranny of the Moment: Fast and Slow Time in the Age of Information* the focus on temporality shifts from the times of the internet to the speed of everyday life. Again, through new media innovation, we are forced to think beyond the metering of the clock to consider the force and origin of contemporary social acceleration or the effects on our temporal awareness by information technologies. 'Speed is contagious', argues Eriksen, a pandemic spread by connection on connection in the digital network. The 'carrier' is new media technologies that saturate time and space with an increasingly accelerated panoply of signs and symbols. These are rendered in the form of *information* that acts as the guide with which we increasingly orient ourselves in the world. But the constant blizzard of informationalised signs and symbols tends to confuse and bewilder, forcing us to fall back on an easily cognated and narrowly focused perception of the world. Social acceleration, Eriksen argues, means that in more and more realms of life, 'context and understanding' are diminished. Acceleration becomes a central technological process in almost wholly technologised world. The 'tyranny' of the moment for Eriksen is the tyranny of the present, a constant now where the past and the future recede and our ability to reflect and project is correspondingly reduced.

References

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5.1

Technology and ideology: the case of the telegraph,
by James Carey

In one of the most famous paragraphs of our most famous autobiography, Henry Adams located the precise moment when "eighteenth-century troglodytic Boston" joined industrial America: "the opening of the Boston and Albany Railroad; the appearance of the first Cunard Steamers in the bay; and the telegraphic messages which carried from Baltimore to Washington the news that Henry Clay and James K. Polk were nominated for the presidency. This was May, 1844" (Adams, 1931: 5).

Adams signaled the absorption of genteel New England into industrial America by three improvements in transportation and communication. Yet for all the significance attached to the telegraph in that famous passage, it remains a product of one of the least studied technologies, certainly the least studied communications technology. The effect of the telegraph on modern life and its role as a model for future developments in communications have scarcely been explored. The first twenty-three volumes of *Technology and Culture* are virtually without reference to the telegraph. Robert L. Thompson's *Wiring a Continent*, the principal history of the telegraph, is now more than forty years old, takes the story only to 1866, and focuses almost exclusively on the formation of Western Union (Thompson, 1947).

I take the neglect of the telegraph to be unfortunate for a number of reasons. First, the telegraph was dominated by the first great industrial monopoly – Western Union, the first communications empire and the prototype of the many industrial empires that were to follow. The telegraph, in conjunction with the railroad, provided the setting in which modern techniques for the management of complex enterprises were first worked out, though for the telegraph in what was eventually monopolistic circumstances.[1] Although the telegraph did not provide the site for the first of the titanic nineteenth-century patent struggles (that prize probably goes to Elias Howe's sewing machine) it led to one of the most significant of them in the rewriting of American law, particularly in the great "telegraph war" between Jay Gould and the Vanderbilt interests for control of the Edison patents for the quadraplex telegraph system, the innovation that Gould rightly prized as the "nerve of industry."[2]

Second, the telegraph was the first product – really the foundation – of the electrical goods industry and thus the first of the science- and engineering-based industries. David Noble's *American by Design: Science, Technology and the Rise of*

Corporate Capitalism (1977) implies throughout a sharp distinction between forms of engineering, such as civil engineering, grounded in a handicraft and guild tradition, and chemical engineering and electrical engineering, which were science-based from the outset. Much that is distinctive about the telegraph, from the organization of the industry to the rhetoric that rationalized it, derives from the particular nature of the engineering it brought into being. More to the point, the telegraph was the first electrical engineering technology and therefore the first to focus on the central problem in modern engineering: the economy of a signal.[3]

Third, the telegraph brought about changes in the nature of language, of ordinary knowledge, of the very structures of awareness. Although in its early days the telegraph was used as a toy – as was the computer, which it prefigured – for playing long-distance chess, its implications for human knowledge were the subject of extended, often euphoric, and often pessimistic debate. Adams saw the telegraph as a demonic device dissipating the energy of history and displacing the Virgin with the Dynamo, whereas Thoreau saw it as an agent of trivialization. An even larger group saw the telegraph as an agency of benign improvement – spiritual, moral, economic, and political. Now that thought could travel by "the singing wire," a new form of reporting and a new form of knowledge were envisioned that would replace traditional literature with a new and active form of scientific knowledge.

Fourth, and partly for the foregoing reasons, the telegraph was a watershed in communication, as I hope to show later. Now, it is easy to overemphasize the revolutionary consequences of the telegraph. It is not an infrequent experience to be driving along an interstate highway and to become aware that the highway is paralleled by a river, a canal, a railroad track, or telegraph and telephone wires. In that instant one may realize that each of these improvements in transportation and communications merely worked a modification on what preceded it. The telegraph twisted and altered but did not displace patterns of connection formed by natural geography: by the river and primitive foot and horse paths and later by the wooden turnpike and canal.

But the innovation of the telegraph can stand metaphorically for all the innovations that ushered in the modern phase of history and determined, even to this day, the major lines of development of American communications. The most important fact about the telegraph is at once the most obvious and innocent: It permitted for the first time the effective separation of communication from transportation. This fact was immediately recognized, but its significance has been rarely investigated. The telegraph not only allowed messages to be separated from the physical movement of objects; it also allowed communication to control physical processes actively. The early use of the telegraph in railroad signaling is an example: telegraph messages could control the physical switching of rolling stock, thereby multiplying the purposes and effectiveness of communication. The separation of communication from transportation has been exploited in most subsequent developments in communication down to computer control systems.

When the telegraph reached the West Coast eight years in advance of a transcontinental railroad, the identity of communication and transportation was ended in both fact and symbol. Before the telegraph, "communication" was used to describe transportation as well as message transmittal for the simple reason that the movement

of messages was dependent on their being carried on foot or horseback or by rail. The telegraph, by ending the identity, allowed symbols to move independently of and faster than transportation. To put it in a slightly different way, the telegraph freed communication from the constraints of geography. The telegraph, then, not only altered the relation between communication and transportation; it also changed the fundamental ways in which communication was thought about. It provided a model for thinking about communication – a model I have called a transmission model – and displaced older religious views of communication even as the new technology was mediated through religious language. And it opened up new ways of thinking about communication within both the formal practice of theory and the practical consciousness of everyday life. In this sense the telegraph was not only a new tool of commerce but also a thing to think with, an agency for the alteration of ideas.

II

A thorough treatment of the consequences of the telegraph would attempt to demonstrate how this instrument altered the spatial and temporal boundaries of human interaction, brought into existence new forms of language as well as new conceptual systems, and brought about new structures of social relations, particularly by fostering a national commercial middle class. These consequences were also displacements: older forms of language and writing declined, traditional social interactions waned, and the pattern of city-state capitalism that dominated the first half of the nineteenth century was broken up (Carey and Sims, 1976: 219–41). I intend now to concentrate on the relationship between the telegraph and ideas, between, broadly, the telegraph and ideology. I hope also to insinuate throughout some observations on the broader matters noted earlier.

There are three relationships between the telegraph and ideology. Two of them have received some attention, and I will mention them only in passing in order to concentrate on a relationship that has not as yet been investigated.

The first is the relationship between the telegraph and monopoly capitalism, the principal subject of Thompson's *Wiring a Continent*. That is, the telegraph was a new and distinctively different force of production that demanded a new body of law, economic theory, political arrangements, management techniques, organizational structures, and scientific rationales with which to justify and make effective the development of a privately owned and controlled monopolistic corporation. This problem can be looked at as one of the relationships among a force of production, the organizational forms and administrative techniques that realize it, and the explanatory and justifying ideology that guides and legitimates its institutionalization. Unfortunately, even in this context the telegraph has not been investigated adequately, partly because of the tendency to eschew historical investigations and to treat forces of production, *tout court*, as all-encompassing rather than to investigate the particular consequences and ideological implications of particular technologies. Technology as such is too abstract a category to support any precise analysis; therefore, changes in technology go unanalyzed except for classifying them within various stages of capitalist development.

Before the telegraph, business relations were personal; that is, they were mediated

through face-to-face relations, by personal correspondence, by contacts among people who, by and large, knew one another as actual persons. The overall coordination of these atomic relations and transactions was provided by the "invisible hand" of the market.

With the telegraph and, of course, the railroads and improvements in other techniques of transport and communication, the volume and speed of transactions demanded a new form of organization of essentially impersonal relations – that is, relations not among known persons but among buyers and sellers whose only relation was mediated through an organization and a structure of management. "The visible hand of management replaced the invisible hand of market forces where and when new technology and expanded markets permitted a historically unprecedented high volume and speed of materials through the processes of production and distribution" (Chandler, 1977: 12). Through the telegraph and railroad the social relations among large numbers of anonymous buyers and sellers were coordinated. But these new and unprecedented relations of communication and contact had themselves to be explained, justified, and made effective. What we innocently describe as theory, law, common sense, religion were means by which these new relations were carried through to explicit consciousness and "naturalized" – made to seem merely of the order of things.

The second connection between ideology and the telegraph resides in the popular imagery, largely religious, that accompanied the latter's introduction. This aspect of the problem has been rather more thoroughly investigated, at least in a general way, within American studies and particularly within what is called the "myth and symbol" school. The telegraph, widely hailed at the time of its introduction as the "noiseless tenant of the wilderness," was clothed in the language of religious aspiration and secular millenarianism, a language Leo Marx names the "rhetoric of the technological sublime." John Quirk and I, thinking more directly of the telegraph and subsequent developments, have called this same language the "rhetoric of the electrical sublime."

There were other technological marvels of the mid-nineteenth century, but the inscrutable nature of the telegraph made it seem more extraordinary than, and qualitatively different from, other inventions. The key to the mystery was, of course, electricity – a force of great potency and yet invisible. It was this invisibility that made electricity and the telegraph powerful impetuses to idealist thought both in religious and philosophical terms. It presented the mystery of the mind–body dualism and located vital energy in the realm of the mind, in the nonmaterial world. Electricity was, in standard terms of the day, "shadowy, mysterious, impalpable. It lives in the skies and seems to connect the spiritual and material" (Czitrom, 1982: 9).[4]

Electricity, the Reverend Ezra S. Gannett told his Boston congregation, was both the "swift winged messenger of destruction" and the "vital energy of material creation. The invisible, imponderable substance, force, whatever it be – we do not even certainly know what it is which we are dealing with . . . is brought under our control, to do our errands, nay, like a very slave" (Czitrom, 1982: 19). Another preacher of the era, Gardner Spring, exclaimed that we were on the "border of a spiritual harvest because thought now travels by steam and magnetic wires" (Miller, 1965: 48). This new technology enters American discussions not as mundane fact but as divinely inspired for the purposes of spreading the Christian message farther and

faster, eclipsing time and transcending space, saving the heathen, bringing closer and making more probable the day of salvation.

There were dissenters, of course, but the general uniformity of reaction to the telegraph demonstrated how it was able to fuse the opposite poles of the electrical sublime: the desire for peace, harmony, and self-sufficiency with the wish for power, profit, and productivity. The presumed "annihilation of time and space" heralded by the telegraph promised to bind the country together just as the portents of the Civil War were threatening to tear it apart. Here the organic metaphors, so easily attributed to German philosophy, floated into American thought as means to describe how the telegraph would change life. As early as 1838, Morse anticipated twentieth-century notions of the "global village." It would not be long, he wrote, "ere the whole surface of this country would be channeled for those nerves which are to diffuse with the speed of thought, a knowledge of all that is occurring throughout the land; making in fact one neighborhood of the whole country" (Czitrom, 1982: 11–12).

And finally, a piece of doggerel typical of the era, entitled "To Professor Morse, In Pleasant Memory of Oct. 9, 1856, at the Albion," expresses the mixture of science, commerce, politics, and pious religious unity that surfaced in popular consciousness with the telegraph:

> A good and generous spirit ruled the hour;
> Old jealousies were drowned in brotherhood;
> Philanthropy rejoiced that Skill and Power,
> Servants to Science, compass all men's good;
> And over all Religion's banner stood,
> Upheld by thee, true patriarch of the plan
> Which in two hemispheres was schemed to shower
> Mercies from God on universal man.
> Yes, this electric chain from East to West
> More than mere metal, more than mammon can,
> Binds us together – kinsmen, in the best,
> As most affectionate and frankest bond;
> Brethren as one; and looking far beyond
> The world in an Electric Union blest!
> (Martin F. Typper, in *Prime*, 1875: 648).

One finds in this rhetoric of the electrical sublime a central tenet of middle-class ideology: that "communication, exchange, motion brings humanity, enlightenment, progress and that isolation and disconnection are evidence of barbarism and merely obstacles to be overcome" (Schivelbusch, 1978: 40). The eighteenth-century ideal of universalism – the Kingdom of God and the Brotherhood of Man – included a belief in a universal Human Nature. People were people – everywhere the same. Communication was the engine that powered this ideal. Each improvement in communication, by ending isolation, by linking people everywhere, was heralded as realizing the Universal Brotherhood of Universal Man.

The argument is not an abstract one. Charles F. Briggs and Augustus Maverick, writing in 1858, made the equation precise:

> It has been the result of the great discoveries of the past century, to effect a revolution in political and social life, by establishing a more intimate connection between nations, with race and race. It has been found that the old system of exclusion and insulation are stagnation and death. National health can only be maintained by the free and unobstructed interchange of each with all. How potent a power, then, is the telegraph destined to become in the civilization of the world! This binds together by a vital cord all the nations of the earth. It is impossible that old prejudices and hostilities should longer exist, while such an instrument has been created for an exchange of thought between all the nations of the earth (Briggs and Maverick, 1858: 21–22).

In another work of the era, Sir William P. Andrews, justifying the Euphrates Valley Railroad connecting India to Africa, quotes an anonymous writer who got the whole matter rather more correctly:

> Nor can it for a moment be doubted that a line of electric telegraphs between Europe and India must be a successful commercial enterprise, putting altogether out of sight the important moral effects which such a means of rapid communication must of necessity bring about. It may, on the contrary, be doubted whether any more efficient means could be adopted to develop the resources of India, and to consolidate British power and strengthen British rule in that country, than by the formation of the proposed system of railways in central Asia and the carrying out of the proposed telegraph communication with Europe.
>
> (Andrews, 1857: 141)

An essentially religious view of communication – or one cloaked, at least, in religious metaphors – is as a mediator – a progressively vanishing mediator – between middle-class aspiration and capitalist and, increasingly, imperial development.[5] Max Weber's tour de force retains its original significance in this context; for Weber's archetype of the formation of the Protestant ethic, Benjamin Franklin, reappears in the mid-nineteenth century as the first electrician, the first to release this new force of moral and social progress. But what needs to be more closely investigated is the relationship between a later stage of economic development, new forms of electrical technology, and a transposed body of religious belief. This is particularly true because, from the telegraph forward, technological development came to be housed in professional engineering societies, universities, and research laboratories. As technological development became more systematic, so did the development of justifying ideologies become more consciously planned and directed by these same groups.

III

In the balance of this chapter I wish to concentrate on the effect of the telegraph on ordinary ideas: the coordinates of thought, the natural attitude, practical consciousness, or, less grandly, common sense. As I have intimated, I think the best way to grasp the effects of the telegraph or any other technology is not through a frontal assault but,

rather, through the detailed investigation in a couple of sites where those effects can be most clearly observed.

Let me suggest some of the sites for those investigations – investigations to be later integrated and referred for elucidation to some general theoretical notions. First, much additional work needs to be done on the effects of the telegraph on language and journalism. The telegraph reworked the nature of written language and finally the nature of awareness itself. There is an old saw, one I have repeated myself, that the telegraph, by creating the wire services, led to a fundamental change in news. It snapped the tradition of partisan journalism by forcing the wire services to generate "objective" news, news that could be used by papers of any political stripe (Carey, 1969: 23–38). Yet the issue is deeper than that. The wire services demanded a form of language stripped of the local, the regional; and colloquial. They demanded something closer to a "scientific" language, a language of strict denotation in which the connotative features of utterance were under rigid control. If the same story were to be understood in the same way from Maine to California, language had to be flattened out and standardized. The telegraph, therefore, led to the disappearance of forms of speech and styles of journalism and story telling – the tall story, the hoax, much humor, irony, and satire – that depended on a more traditional use of the symbolic, a use I earlier called the fiduciary.[6] The origins of objectivity may be sought, therefore, in the necessity of stretching language in space over the long lines of Western Union. That is, the telegraph changed the forms of social relations mediated by language. Just as the long lines displaced a personal relation mediated by speech and correspondence in the conduct of trade and substituted the mechanical coordination of buyer and seller, so the language of the telegraph displaced a fiduciary relationship between writer and reader with a coordinated one.

Similarly, the telegraph eliminated the correspondent who provided letters that announced an event, described it in detail, and analyzed its substance, and replaced him with the stringer who supplied the bare facts. As words were expensive on the telegraph, it separated the observer from the writer. Not only did writing for the telegraph have to be condensed to save money – telegraphic, in other words – but also from the marginal notes and anecdotes of the stringer the story had to be reconstituted at the end of the telegraphic line, a process that reaches high art with the news magazines, the story divorced from the story teller.

But as every constraint is also an opportunity, the telegraph altered literary style. In a well-known story, "cablese" influenced Hemingway's style, helping him to pare his prose to the bone, dispossessed of every adornment. Most correspondents chafed under its restrictiveness, but not Hemingway. "I had to quit being a correspondent," he told Lincoln Steffens later. "I was getting too fascinated by the lingo of the cable."[7] But the lingo of the cable provided the underlying structure for one of the most influential literary styles of the twentieth century.

There were other effects – some obvious, some subtle. If the telegraph made prose lean and unadorned and led to a journalism without the luxury of detail and analysis, it also brought an overwhelming crush of such prose to the newsroom. In the face of what was a real glut of occurrences, news judgment had to be routinized and the organization of the newsroom made factory-like. The reporter who produced the new prose moved into prominence in journalism by displacing the editor as the

archetype of the journalist. The spareness of the prose and the sheer volume of it allowed news – indeed, forced news – to be treated like a commodity: something that could be transported, measured, reduced, and timed. In the wake of the telegraph, news was subject to all the procedures developed for handling agricultural commodities. It was subject to "rates, contracts, franchising, discounts and thefts.[8]

A second site for the investigation of the telegraph is the domain of empire. Again, it is best not to assault the problem as an overarching theory of imperialism but, rather, to examine specific cases and specific connections: the role of the telegraph in coordinating military, particularly naval, operations; the transition from colonialism, where power and authority rested with the domestic governor, to imperialism, where power and authority were reabsorbed by the imperial capital; the new forms of political correspondence that came about when the war correspondent was obliged to use the telegraph; and the rise of the first forms of international business that could be called multinational.

While the growth of empire and imperialism have been explained by virtually every possible factor, little attention has been paid to telegraphy in generating the ground conditions for the urban imperialism of the mid-nineteenth century and the international imperialism later in the century.[9] It is probably no accident that the words "empire" and "imperialism" entered the language in 1870, soon after the laying of the transatlantic cable. Although colonies could be held together with printing, correspondence, and sail, the hold, as the American experience shows, was always tenuous over great distance. Moreover, in colonial arrangements the margin had as much power as the center. Until the transatlantic cable, it was difficult to determine whether British colonial policy was being set in London or by colonial governors in the field – out of contact and out of control. It was the cable and telegraph, backed, of course, by sea power, that turned colonialism into imperialism: a system in which the center of an empire could dictate rather than merely respond to the margin.[10]

The critical change lay in the ability to secure investments. There was no heavy overseas investment until the control made possible by the cable. The innovation of the telegraph created, if not the absolute impetus for imperial expansion, then at least the wherewithal to make the expansion theoretically tenable. But it also created a tension between the capability to expand and the capacity to rule.

With the development of the railroad, steam power, the telegraph and cable, a coherent empire emerged based on a coherent system of communication. In that system the railroad may be taken as the overland extension of the steamer or vice versa, and the telegraph and cable stood as the coordinating, regulating device governing both.[11]

Although the newspaper and imperial offices are among the best sites at which to look for the effects of the telegraph, there are humbler locations of equal interest. It surely is more than an accident that many of the great nineteenth-century commercial empires were founded in the humble circumstances of the telegraph operator's shack. The case of Richard B. Sears of North Redwood, Minnesota, is instructive. One must not forget that Edison and Carnegie began the same way and that the genius of Jay Gould lay in his integration of the telegraph with the railroad. The significance of the telegraph in this regard is that it led to the selective control and transmission of information. The telegraph operator was able to monopolize knowledge, if only for a

few moments, along a route; and this brought a selective advantage in trading and speculation. But it was this same control of information that gave the telegraph a central importance in the development of modern gambling and of the business of credit. Finally, it was central to the late nineteenth-century explosion in forms of merchandising, such as the mail-order house.[12]

In the balance of this essay I want to cut across some of these developments and describe how the telegraph altered the ways in which time and space were understood in ordinary human affairs and, in particular, to examine a changed form in which time entered practical consciousness. To demonstrate these changes I wish to concentrate on the developments of commodity markets and on the institutionalization of standard time. But first let me reiterate the basic argument.

The simplest and most important point about the telegraph is that it marked the decisive separation of "transportation" and "communication." Until the telegraph these words were synonymous. The telegraph ended that identity and allowed symbols to move independently of geography and independently of and faster than transport. I say decisive separation because there were premonitions earlier of what was to come, and there was, after all, pre-electric telegraphy – line-of-sight signaling devices.

Virtually any American city of any vintage has a telegraph hill or a beacon hill reminding us of such devices. They relied on shutters, flaps, disks, or arms operating as for semaphoric signaling at sea. They were optical rather than "writing at a distance" systems and the forerunners of microwave networks, which rely on relay stations on geographic high points for aerial transmissions.

Line-of-sight telegraphy came into practical use at the end of the eighteenth century. Its principal architect was a Frenchman, Claud Chappe, who persuaded the Committee of Public Instruction in post-Revolutionary France to approve a trial. Joseph Lakanal, one of its members, reported back to the committee on the outcome: "What brilliant destiny do science and the arts not reserve for a republic which by its immense population and the genius of its inhabitants, is called to become the nation to instruct Europe" (Wilson, 1976: 122).

The National Convention approved the adoption of the telegraph as a national utility and instructed the Committee of Public Safety to map routes. The major impetus to its development in France was the same as the one that led to the wave of canal and railroad building in America. The pre-electric telegraph would provide an answer to Montesquieu and other political theorists who thought France or the United States too big to be a republic. But even more, it provided a means whereby the departments that had replaced the provinces after the Revolution could be tied to and coordinated with the central authority (Wilson, 1976: 123).

The pre-electric telegraph was also a subject of experimentation in America. In 1800, a line-of-sight system was opened between Martha's Vineyard and Boston (Wilson, 1976: 210). Between 1807 and 1812, plans were laid for a telegraph to stretch from Maine to New Orleans. The first practical use of line-of-sight telegraphy was for the transmission of news of arriving ships, a practice begun long before 1837 (Thompson, 1947: 11). But even before line-of-sight devices had been developed, alterations in shipping patterns had led to the separation of information from cargo, and that had important consequences for international trade. I shall say more on this later.

Despite these reservations and qualifications, the telegraph provided the decisive and cumulative break of the identity of communication and transportation. The great theoretical significance of the technology lay not merely in the separation but also in the use of the telegraph as both a model of and a mechanism for control of the physical movement of things, specifically for the railroad. That is the fundamental discovery: not only can information move independently of and faster than physical entities, but it also can be a simulation of and control mechanism for what has been left behind. The discovery was first exploited in railroad dispatching in England in 1844 and in the United States in 1849. It was of particular use on the long stretches of single-track road in the American West, where accidents were a serious problem. Before the use of the telegraph to control switching, the Boston and Worcester Railroad, for one example, kept horses every five miles along the line, and they raced up and down the track so that their riders could warn engineers of impending collisions (Thompson, 1947: 205–206). By moving information faster than the rolling stock, the telegraph allowed for centralized control along many miles of track. Indeed, the operation of the telegraph in conjunction with the railroad allowed for an integrated system of transport and communication. The same principle realized in these mundane circumstances governs the development of all modern processes in electrical transmission and control from guided gun sights to simple servo mechanisms that open doors. The relationship of the telegraph and the railroad illustrates the basic notion of systems theory and the catch phrase that the "system is the solution," in that the integrated switched system is more important than any of its components.

The telegraph permitted the development, in the favorite metaphor of the day, of a thoroughly encephalated social nervous system in which signaling was divorced from musculature. It was the telegraph and the railroad – the actual, painful construction of an integrated system – that provided the entrance gate for the organic metaphors that dominated nineteenth-century thought. Although German romanticism and idealism had their place, it is less to the world of ideas and more to the world of actual practice that we need to look when trying to figure out why the nineteenth century was obsessed with organicism.

The effect of the telegraph on ideology, on ordinary ideas, can be shown more graphically with two other examples drawn from the commodities markets and the development of standard time. The telegraph, like most innovations in communication down through the computer, had its first and most profound impact on the conduct of commerce, government, and the military. It was, in short, a producer good before it was a consumer good. The telegraph, as I said earlier, was used in its early months for the long-distance playing of chess. Its commercial significance was slow to be realized. But once that significance was determined, it was used to reorganize commerce; and from the patterns of usage in commerce came many of the telegraph's most profound consequences for ordinary thought. Among its first effects was the reorganization of commodity markets.

It was the normal expectation of early nineteenth century Americans that the price of a commodity would diverge from city to city so that the cost of wheat, corn, or whatever would be radically different in, say, Pittsburgh, Cincinnati, and St. Louis. This belief reflected the fact that before the telegraph, markets were independent of one another, or, more accurately, that the effect of one market on another was so

gradually manifested as to be virtually unnoticed. In short, the prices of commodities were largely determined by local conditions of supply and demand. One of the leading historians of the markets has commented, "To be sure in all articles of trade the conditions at all sources of supply had their ultimate effect on distant values and yet even in these the communication was so slow that the conditions might change entirely before their effect could be felt" (Emery, 1896: 106).

Under such circumstances, the principal method of trading is called arbitrage: buying cheap and selling dear by moving goods around in space. That is, if prices are higher in St. Louis than in Cincinnati, it makes sense to buy in Cincinnati and resell in St. Louis, as long as the price differential is greater than the cost of transportation between the two cities. If arbitrage is widely practiced between cities, prices should settle into an equilibrium whereby the difference in price is held to the difference in transportation cost. This result is, in turn, based on the assumption of classical economics of perfect information – that all buyers and sellers are aware of the options available in all relevant markets – a situation rarely approached in practice before the telegraph.

Throughout the United States, price divergence between markets declined during the nineteenth century. Arthur H. Cole computed the average annual and monthly price disparity for uniform groups of commodities during the period 1816–1842, that is, up to the eve of the telegraph. Over that period the average annual price disparity fell from 9.3 to 4.8; and the average monthly disparity, from 15.4 to 4.8 (Cole, 1938: 94–96, 103). The decline itself is testimony to improvements in communication brought about by canal and turnpike building. The steepness of the decline is probably masked somewhat because Cole grouped the prices for the periods 1816–1830 and 1830–1842, whereas it was late in the canal era and the beginnings of large-scale railroad building that the sharpest declines were felt.

Looked at from one side, the decline represents the gradual increase in the effective size of the market. Looked at from the other side, it represents a decline in spatially based speculative opportunities – opportunities, that is, to turn trade into profit by moving goods between distinct markets. In a sense the railroad and canal regionalized markets; the telegraph nationalized them.

The effect of the telegraph is a simple one: it evens out markets in space. The telegraph puts everyone in the same place for purposes of trade; it makes geography irrelevant. The telegraph brings the conditions of supply and demand in all markets to bear on the determination of a price. Except for the marginal exception here and there, it eliminates opportunities for arbitrage by realizing the classical assumption of perfect information.

But the significance of the telegraph does not lie solely in the decline of arbitrage; rather, the telegraph shifts speculation into another dimension. It shifts speculation from space to time, from arbitrage to futures. After the telegraph, commodity trading moved from trading between places to trading between times. The arbitrager trades Cincinnati for St. Louis; the futures trader sells August against October, this year against next. To put the matter somewhat differently, as the telegraph closed down spatial uncertainty in prices it opened up, because of improvements in communication, the uncertainty of time. It was not, then, mere historic accident that the Chicago Commodity Exchange, to this day the principal American futures market, opened

in 1848, the same year the telegraph reached that city. In a certain sense the telegraph invented the future as a new zone of uncertainty and a new region of practical action.

Let me make a retreat from that conclusion about the effects of the telegraph on time because I have overdrawn the case. First, the opportunities for arbitrage are never completely eliminated. There are always imperfections in market information, even on the floor of a stock exchange: buyers and sellers who do not know of one another and the prices at which the others are willing to trade. We know this as well from ordinary experience at auctions, where someone always knows a buyer who will pay more than the auctioned price. Second, there was a hiatus between arbitrage and the futures market when time contracts dominated, and this was a development of some importance. An approximation of futures trading occurred as early as 1733, when the East India Company initiated the practice of trading warrants. The function of a warrant was to transfer ownership of goods without consummating their physical transfer. The warrant did not represent, as such, particular warehoused goods; they were merely endorsed from person to person. The use of warrants or time contracts evolved rapidly in the United States in the trading of agricultural staples. They evolved to meet new conditions of effective market size and, as importantly, their evolution was unrestrained by historic practice.

The critical condition governing the development of time contracts was also the separation of communication from transport. Increasingly, news of crop conditions reached the market before the commodity itself. For example, warrant trading advanced when cotton was shipped to England by sail while passengers and information moved by steamer. Based on news of the crop and on samples of the commodity, time contracts or "to-arrive" contracts were executed. These were used principally for transatlantic sales, but after the Mississippi Valley opened up to agricultural trade, they were widely used in Chicago in the 1840s (Baer and Woodruff, 1935: 3–5).

The telegraph started to change the use of time contracts, as well as arbitrage. By widely transmitting knowledge of prices and crop conditions, it drew markets and prices together. We do not have good before-and-after measures, but we do have evidence, cited earlier, for the long-run decline in price disparities among markets. Moreover, we have measures from Cincinnati in particular. In the 1820s Cincinnati lagged two years behind Eastern markets. That meant that it took two years for disturbances in the Eastern market structure to affect Cincinnati prices. By 1840 the lag was down to four months; and by 1857 – and probably much earlier – the effect of Eastern markets on Cincinnati was instantaneous. But once space was, in the phrase of the day, annihilated, once everyone was in the same place for purposes of trade, time as a new region of experience, uncertainty, speculation, and exploration was opened up to the forces of commerce.

A back-door example of this inversion of space and time can be drawn from a later episode involving the effect of the telephone on the New York Stock Exchange. By 1894 the telephone had made information time identical in major cities. Buyers and sellers, wherever they were, knew current prices as quickly as traders did on the floor of the exchange. The information gap, then, between New York and Boston had been eliminated and business gravitated from New York to Boston brokerage firms. The New York exchange countered this movement by creating a thirty-second time

advantage that ensured New York's superiority to Boston. The exchange ruled that telephones would not be allowed on the floor. Price information had to be relayed by messenger to an area off the floor of the exchange that had been set aside for telephones. This move destroyed the temporal identity of markets, and a thirty-second monopoly of knowledge was created that drew business back to New York (Emery, 1896: 139).

This movement of commodities out of space and into time had three other consequences of great importance in examining the effect of the telegraph. First, futures trading required the decontexualization of markets; or, to put it in a slightly different way, markets were made relatively unresponsive to local conditions of supply and demand. The telegraph removed markets from the particular context in which they were historically located and concentrated on them forces emanating from any place and any time. This was a redefinition from physical or geographic markets to spiritual ones. In a sense they were made more mysterious; they became everywhere markets and everytime markets and thus less apprehensible at the very moment they became more powerful.

Second, not only were distant and amorphous forces brought to bear on markets, but the commodity was sundered from its representations; that is, the development of futures trading depended on the ability to trade or circulate negotiable instruments independently of the actual physical movement of goods. The representation of the commodity became the warehouse receipts from grain elevators along the railroad line. These instruments were then traded independently of any movement of the actual goods. The buyer of such receipts never expected to take delivery; the seller of such receipts never expected to make delivery. There is the old joke, which is also a cautionary tale, of the futures trader who forgot what he was up to and ended up with forty tons of wheat on his suburban lawn; but it is merely a joke and a tale. The futures trader often sells before he buys, or buys and sells simultaneously. But the buying and selling is not of goods but of receipts. What is being traded is not money for commodities but time against price. In short, the warehouse receipt, which stands as a representation of the product, has no intrinsic relation to the real product.

But in order to trade receipts rather than goods, a third change was necessary. In futures trading products are not bought or sold by inspection of the actual product or a sample thereof. Rather, they are sold through a grading system. In order to lend itself to futures trading, a product has to be mixed, standardized, diluted in order to be reduced to a specific, though abstract, grade. With the coming of the telegraph, products could no longer be shipped in separate units as numerous as there were owners of grain. "The high volume sales required impersonalized standards. Buyers were no longer able personally to check every lot" (Chandler, 1977: 211). Consequently, not all products are traded on the futures market because some resist the attempt to reduce them to standardized categories of quality.

The development of the futures markets, in summary, depended on a number of specific changes in markets and the commodity system. It required that information move independently of and faster than products. It required that prices be made uniform in space and that markets be decontextualized. It required, as well, that commodities be separated from the receipts that represent them and that commodities be reduced to uniform grades.

These were, it should be quickly added, the conditions that underlay Marx's analysis of the commodity fetish. That concept, now used widely and often indiscriminately, was developed in the *Grundrisse* and *Das Kapital* during the late 1850s, when futures trading became the dominant arena for the establishment of agricultural values. In particular, Marx made the key elements in the commodity fetish the decontextualization of markets, the separation of use value from exchange value brought about by the decline in the representative function of the warehouse receipt, and the abstraction of the product out of real conditions of production by a grading system. In the *Grundrisse* he comments, "This locational movement – the bringing of the product to market which is a necessary condition of its circulation, except when the point of production is itself a market – could more precisely be regarded as the transformation of the product into a commodity" (Marx, 1973: 534).

Marx's reference is to what Walter Benjamin (1968) would later call the "loss of aura" in his parallel analysis of the effect of mechanical reproduction on the work of art. After the object is abstracted out of the real conditions of its production and use and is transported to distant markets, standardized and graded, and represented by fully contingent symbols, it is made available as a commodity. Its status as a commodity represents the sundering of a real, direct relationship between buyer and seller, separates use value from exchange value, deprives objects of any uniqueness (which must then be returned to the object via advertising), and, most important, masks to the buyer the real conditions of production. Further, the process of divorcing the receipt from the product can be thought of as part of a general social process initiated by the use of money and widely written about in contemporary semiotics; the progressive divorce of the signifier from the signified, a process in which the world of signifiers progressively overwhelms and moves independently of real material objects.

To summarize, the growth of communications in the nineteenth century had the practical effect of diminishing space as a differentiating criterion in human affairs. What Harold Innis called the "penetrative powers of the price system" was, in effect, the spread of a uniform price system throughout space so that for purposes of trade everyone was in the same place. The telegraph was the critical instrument in this spread. In commerce this meant the decontextualization of markets so that prices no longer depended on local factors of supply and demand but responded to national and international forces. The spread of the price system was part of the attempt to colonize space. The correlative to the penetration of the price system was what the composer Igor Stravinsky called the "statisticalization of mind": the transformation of the entire mental world into quantity, and the distribution of quantities in space so that the relationship between things and people becomes solely one of numbers. Statistics widens the market for everything and makes it more uniform and interdependent. The telegraph worked this same effect on the practical consciousness of time through the construction of standard time zones.

IV

Our sense of time and our activities in time are coordinated through a grid of time zones, a grid so fixed in our consciousness that it seems to be the natural form of time, at least until we change back and forth between standard and daylight saving time. But

standard time in the United States is a relatively recent invention. It was introduced on November 18, 1883.

Until that date virtually every American community established its own time by marking that point when the sun reached its zenith as noon. It could be determined astronomically with exactitude; but any village could do it, for all practical purposes, by observing the shortest shadow on a sundial. Official local time in a community could be fixed, as since time immemorial, by a church or later by a courthouse, a jeweler, or later still the railroad stationmaster; and a bell or whistle could be rung or set off so that the local burghers could set their timepieces. In Kansas City a ball was dropped from the highest building at noon and was visible for miles around, a practice still carried out at the annual New Year's Eve festivities in New York City's Times Square (Corliss, 1952).

Not every town kept its own time; many set their clocks in accord with the county seat or some other nearby town of commercial or political importance. When the vast proportion of American habitats were, in Robert Wiebe's (1967) phrase, "island communities" with little intercourse with one another, the distinctiveness of local time caused little confusion and worry. But as the tentacles of commerce and politics spread out from the capitals, temporal chaos came with them. The chaos was sheerly physical. With every degree of longitude one moved westward, the sun reached its zenith four minutes later. That meant that when it was noon in Boston it was 11:48 a.m. in Albany; when it was noon in Atlanta it was 11:36 a.m. in New Orleans. Put differently, noon came a minute later for every quarter degree of longitude one moved westward, and this was a shorter distance as one moved north: in general thirteen miles equaled one minute of time.

The setting of clocks to astronomically local time or, at best, to county seat time led to a proliferation of time zones. Before standard time Michigan had twenty-seven time zones; Indiana, twenty-three; Wisconsin, thirty-nine; Illinois, twenty-seven. The clocks in New York, Boston, and Philadelphia, cities today on identical time, were several minutes apart (Corliss, 1952: 3). When it was 12:00 in Washington, D.C., it was 11:30 in Atlanta, 12:09 in Philadelphia, 12:12 in New York, 12:24 in Boston, and 12:41 in Eastport, Maine.

As the railroads spread across the continent, the variety of local times caused enormous confusion with scheduling, brought accidents as trains on different clocks collided, and led to much passenger irritation, as no one could easily figure when a train would arrive at another town. The railroads used fifty-eight local times keyed to the largest cities. Moreover, each railroad keyed its clocks to the time of a different city. The Pennsylvania Railroad keyed its time to that of Philadelphia, but Philadelphia's clocks were twelve minutes behind New York's and five minutes ahead of Baltimore's. The New York Central stuck to New York City time. The Baltimore and Ohio keyed its time to three cities: Baltimore; Columbus, Ohio; and Vincennes, Indiana (Bartky and Harrison, 1979: 46–53).

The solution, which was to establish standard time zones, had long attracted the interest of scholars. The pressure to establish such zones was felt more strongly in North America, which averaged eight hours of daylight from Newfoundland to western Alaska. Although standard time was established earlier in Europe, the practical pressure there was less. There is only a half-hour variance in sun time across

England; and France, while larger, could be run on Paris time. But England, for purposes of empire, had long been interested in standard time. The control of time allows for the coordination of activity and, therefore, effective social control. In navigation, time was early fixed on English ships according to the clock of the Greenwich observatory; and no matter where a ship might be in the Atlantic, its chronometer always registered Greenwich time. Similarly, Irish time was regulated by a clock set each morning at Big Ben, carried by rail to Holyhead, ferried across the Irish sea to Kingstown (now Dun Laoghaire), and then carried again by rail to Dublin, where Irish clocks were coordinated with English time (Schivelbusch, 1978: 39).

And so it was no surprise when in 1870 a New Yorker, Charles Dowd, proposed a system of standard time zones that fixed Greenwich as zero degrees longitude and laid out the zones around the world with centers 15 degrees east and west from Greenwich. As 15 degrees equals one hour, the world was laid out in twenty-four zones one hour apart.

Dowd's plan was a wonderful example of crackpot realism. The lines were laid out with geometric exactness and ignored geography, topography, region, trade, or natural affinity. Maine and Florida were put in separate time zones. It is a wonderful example of the maxim that the grid is the geometry of empire. Dowd recommended the plan to the railroads, which adopted it provisionally and created an index out of it so that the traveler could convert railroad time to local time by adding or subtracting so many minutes to or from the railroad schedule.

For thirteen years the Dowd system was debated but never officially adopted by the General Time Convention. The railroads tried during that period to get Congress to adopt it as a uniform time system, but Congress would not and for an obvious reason: standard time offended people with deeply held religious sentiments. It violated the actual physical working of the natural order and denied the presence of a divinely ordained nature. But even here religious language was a vanishing mediator for political sentiments; standard time was widely known as Vanderbilt's time, and protest against it was part of the populist protest against the banks, the telegraph, and the railroad.

In 1881, the Philadelphia General Time Convention turned the problem over to William Frederick Allen, a young civil engineer; two years later he returned a plan. It was based on Dowd's scheme but with a crucial difference: it allowed for the adjustment of time zones for purposes of economy and ecology. In his scheme time boundaries could be shifted up to 100 miles away from the geometric lines in order to minimize disruption. Most important, he recommended that the railroads abandon the practice of providing a minute index and that they simply adopt standard time for regulating their schedules and allow communities and institutions to adjust to the new time in any manner they chose.

In the Allen plan the United States was divided into four time zones, with centers on the 75th, 90th, 105th, and 120th meridians: Philadelphia, St. Louis, Denver, and Reno were the approximate centers. The zones extended seven and a half degrees to either side of the center line. November 18, 1883, was selected as the date for the changeover from local to standard time, and an ambitious "educational" campaign was mounted to help citizens adjust to the new system. On that date Chicago, the railroad hub, was tied by telegraph to an observatory in Allegheny, Pennsylvania.

When it reached one o'clock over the center of the Eastern time zone, the clocks were stopped at noon in Chicago and held for nine minutes and thirty-two seconds until the sun centered on the 90th meridian. Then they were started again, with the railroad system now integrated and coordinated through time.

The changeover was greeted by mass meetings, anger, and religious protest but to no avail. Railroad time had become standard time. It was not made official U.S. time until the emergency of World War I. But within a few months after the establishment of railroad time, the avalanche of switches to it by local communities was well under way. Strangely enough, the United States never did go to 24-hour time and thus retained some connection between the diurnal cycle of human activity and the cycle of the planets.

The boundaries of the time zones have been repeatedly adjusted since that time. In general they have been made to follow state borders, but there are a number of exceptions. The western edge of the Eastern time zone was once in eastern Ohio, but now it forms a jagged line along the Illinois–Indiana border. Boise, Idaho, was moved from Pacific to Mountain time, and recently twelve thousand square miles of Arizona was similarly moved. The reasons for such changes tell us much about America's purposes. One gets the distinct feeling, for example, that the television networks would prefer a country with three time zones: east, central, and west.

Standard time zones were established because in the eyes of some they were necessary. They were established, to return to the point of this chapter, because of the technological power of the telegraph. Time was sent via the telegraph wire; but today, thanks to technical improvements, it is sent via radio waves from the Naval observatory in Maryland. The telegraph could send time faster than a railroad car could move; and therefore it facilitated the temporal coordination and integration of the entire system. Once that was possible, the new definitions of time could be used by industry and government to control and coordinate activity across the country, infiltrate into the practical consciousness of ordinary men and women, and uproot older notions of rhythm and temporality.

The development of standard time zones served to overlay the world with a grid of time in the same way the surveyor's map laid a grid of space on old cities, the new territories of the West, or the seas. The time grid could then be used to control and coordinate activities within the grid of space.

V

When the ecological niche of space was filled, filled as an arena of commerce and control, attention was shifted to filling time, now defined as an aspect of space, a continuation of space in another dimension. As the spatial frontier was closed, time became the new frontier. Let me mention, in closing, two other dimensions of the temporal frontier.

An additional time zone to be penetrated once space was exhausted was sacred time, in particular the sabbath. The greatest invention of the ancient Hebrews was the idea of the sabbath, though I am using this word in a fully secular sense: the invention of a region free from control of the state and commerce where another dimension of life could be experienced and where altered forms of social relationship could occur.

As such, the sabbath has always been a major resistance to state and market power. For purposes of communication, the effective penetration of the sabbath came in the 1880s with the invention of the Sunday newspaper. It was Hearst with his New York Sunday *World* who popularized the idea of Sunday newspaper reading and created, in fact, a market where none had existed before – a sabbath market. Since then the penetration of the sabbath has been one of the "frontiers" of commercial activity. Finally, when the frontier in space was officially closed in 1890, the "new frontier" became the night, and since then there has been a continuous spreading upward of commercial activity. Murray Melbin (1987) has attempted to characterize "night as a frontier." In terms of communication the steady expansion of commercial broadcasting into the night is one of the best examples. There were no 24-hour radio stations in Boston, for example, from 1918 through 1954; now half of the stations in Boston operate all night. Television has slowly expanded into the night at one end and at the other initiated operations earlier and earlier. Now, indeed, there are 24-hour television stations in major markets.

The notion of night as frontier, a new frontier of time that opens once space is filled, is a metaphor, but it is more than that. Melbin details some of the features common to the spatial and temporal frontiers: they both advance in stages; the population is more sparsely settled and homogeneous; there is solitude, an absence of social constraints, and less persecution; settlements are isolated; government is decentralized; lawlessness and violence as well as friendliness and helpfulness increase; new behavioral styles emerge. That is, the same dialectic between centralization and decentralization occurs on the temporal frontier as on the spatial frontier. On the one hand, communication is even more privatized at night. On the other hand, social constraints on communication are relaxed because the invasive hand of authority loosened.

The penetration of time, the use of time as a mechanism of control, the opening of time to commerce and politics has been radically extended by advances in computer technology. Time has been redefined as an ecological niche to be filled down to the microsecond, nanosecond, and picosecond – down to a level at which time can be pictured but not experienced. This process and the parallel reconstruction of practical consciousness and practical activity begins in those capacities of the telegraph which prefigure the computer. The telegraph constructed a simulacrum of complex systems, provided an analogue model of the railroad and a digital model of language. It coordinated and controlled activity in space, often behind the backs of those subject to it.

E. P. Thompson finds it ominous that the young Henry Ford should have created a watch with two dials: one for local time and another for railroad time. "Attention to time in labour depends in large degree upon the need for the synchronization of labour" (Thompson, 1967: 70). Modern conceptions of time have rooted into our consciousness so deeply that the scene of the worker receiving a watch at his retirement is grotesque and comic. He receives a watch when the need to tell time is ended. He receives a watch as a tribute to his learning the hardest lesson of the working man – to tell time.

As the watch coordinated the industrial factory; the telegraph via the grid of time coordinated the industrial nation. Today, computer time, computer space, and

computer memory, notions we dimly understand, are reworking practical consciousness coordinating and controlling life in what we glibly call the postindustrial society. Indeed, the microcomputer is replacing the watch as the favored gift for the middle class retiree. In that new but unchanging custom we see the deeper relationship between technology and ideology.

Notes

1 See Chandler (1977), esp. Part II.
2 Among the most readable, accessible sources on the patent struggles is Josephson (1959).
3 See Wiener (1948: 38–44).
4 Whereas I have commented on the essentially religious metaphors that greeted the telegraph in the essays cited, Czitrom (1982) brings this material together in a systematic way.
5 By a vanishing mediator – a concept borrowed from Fredric Jameson – I mean a notion that serves as a bearer of change but that can disappear once that change is ratified in the reality of institutions. See Jameson (1974: 111–149).
6 See chapter 1. On changes in styles of journalism, see Sims (1979).
7 Steffens (1958: 834). For a memoir that discusses the art and adversity of writing for the cable, see Shirer (1976: 282 ff.).
8 The quotation is from an as yet unpublished manuscript by Douglas Birkhead of the University of Utah. Birkhead develops these themes in some detail.
9 On urban imperialism, see Schlesinger (1933) and Pred (1973).
10 Among the few studies on the telegraph and empire, the most distinguished is Fortner (1978); see also Field (1978: 644–68).
11 In making these remarks I am much indebted to the work of Fortner and Field.
12 On these matters there are useful suggestions in Boorstin (1973).

5.2

Reflections on time, time–space compression and technology in the nineteenth century,
by Jeremy Stein

Introduction

Social scientists have long been aware of the significance of developments in transport and communication for the reorientation of temporal and spatial relationships between places (Janelle, 1968; Falk and Abler, 1980). The concepts 'time–space convergence' and 'time–space compression' were developed by geographers to describe the cumulative effects of historical improvements in the speed of movement of goods, services and information. The former concept refers to the increased velocity of circulation of goods, people and information, and the consequent reduction in relative distances between places. The latter concept describes the sense of shock and disorientation such experiences produce (Harvey, 1989, 1990). As Harvey describes it, time–space compression refers to:

> processes that so revolutionise the objective qualities of space and time that we are forced to alter, sometimes in quite radical ways, how we represent the world to ourselves. I use the word 'compression' because a strong case can be made that the history of capitalism has been characterised by speed-up in the pace of life, while so overcoming spatial barriers that the world sometimes seems to collapse inwards upon us.
>
> (Harvey, 1989: 240)

Harvey's discussion of time–space compression relates mainly to contemporary capitalism. He views new ways of experiencing time and space as coinciding with intense periods of technological change, a consequence of capitalism's need to speed up the circulation of capital and information. Other writers emphasise how new communications technologies shape contemporary economic, social and political processes. These writers point to the increasing speed, volume and significance of capital and information flows in recent times (Castells, 1989; Leyshon, 1995). Enabled by instantaneous communication between places, organisations are increasingly able to integrate and co-ordinate their activities on a global basis, captured by the term 'globalisation'. At their most extreme, writers suggest that an era of ceaseless global

flows of money, capital and information heralds the end of geography (O'Brien, 1991). However, as Thrift and others argue, flows of capital and information rarely lack a geography of their own, and because communities of experts are required to interpret their significance, this often reinforces traditional national, institutional and urban geographies (Thrift, 1995, 1996; Michie, 1997).

The main aim of this chapter is to show that contemporary notions and experiences of time–space compression were prefigured in the nineteenth century. In the next section, I will briefly summarise these experiences and their significance. I suggest that these accounts of changing experiences of time and space may need revision in at least two ways. First, interpretations of time–space compression typically rely on accounts of privileged social observers, and are thereby elitist. Is it right to assume that the experiences of time and space documented by privileged travellers were equally felt by the general population, or that the rapidity of change was the same for everyone? Second, changing experiences of time and space are often assumed to result from the advent of new technologies. This is a form of technological determinism. The danger here is to assume and to exaggerate the consequences of technology. Are new technologies always faster and more efficient than earlier ones? Moreover, do interpretations of time–space compression that see it resulting from improvements in technology risk ignoring the social processes in which technology is embedded? After reviewing historical accounts of time–space compression, I will draw on my own research on a nineteenth-century Canadian textile town to develop a more nuanced interpretation of the historical experiences of time and space.

A shrinking world

As Harvey and other writers have suggested, experiences of time–space compression are not limited to the contemporary period. Giddens' interpretation of modernity, for example, emphasises the role of technology and institutions associated with it (state agencies, businesses, news media) in extending economic, social and political influence over time and space during the nineteenth and twentieth centuries (Giddens, 1990). Berman stresses the unifying role of technology, defining nineteenth-century modernity as the shared experience of unity and disunity (Berman, 1991). For several writers the period between 1880 and the end of the First World War witnessed an intense phase of time–space compression. Marvin describes how the introduction of electrification at the end of the nineteenth century led to intense cultural anxiety concerning the effects of these technologies on Victorian and Edwardian societies, governed by strict systems of hierarchy and social etiquette (Marvin, 1988). Kern demonstrates how during this period a set of new technologies, including the telephone and the wireless telegraph, generated intense feelings of simultaneity coincident with novel ways of thinking about time and space in areas of social thought as diverse as physics and psychology, contemporary art and music (Kern, 1983).

The rapid introduction of a set of new technologies at the end of the nineteenth century no doubt contributed to intense feelings of simultaneity during this period. However, this does not mean that a revolution occurred in the experience of time and space. It is more appropriate to see these changes in the context of on-going processes of change occurring from at least the late eighteenth century. In the next

few paragraphs I will summarise the most salient aspects of these changes and their consequences. Before doing so it is worth noting that authors such as Kern have been criticised for other reasons: for their overreliance on elite sources, such as the electrical trade literature that not surprisingly glorifies technological advances; and for their technological determinism. Kern, for example, argues that, because of its immediacy and democratic qualities, technologies such as the telephone invaded privacy, resulting in nervous dispositions and undermining social and spatial barriers. Critics question whether the consequences of technology are inevitable or predictable, and whether the characteristics of a technology can automatically be assumed to be impressed on to its users (Fischer, 1985, 1992; Marx, 1997a, 1997b).

Without doubt, the cumulative effects of technological change, especially over the past century and a half in the field of transport and communication, have been impressive. This was particularly the case in Europe and North America during the nineteenth century when the introduction of railway, telegraph and steamship services radically reoriented geographic and temporal relationships. 'The annihilation of space and time' was a common mid-nineteenth century phrase used to describe the experience and significance of these changes. Karl Marx, writing in the 1850s, used similar terminology to describe the significance of improved transport and communications for the circulation and reproduction of capital. In the *Grundrisse* he wrote that 'while capital must on one side strive to tear down every spatial barrier to intercourse . . . it strives on the other side to annihilate this space with time, i.e. to reduce to a minimum the time spent in motion from one place to another' (Marx, 1973: 539).

Developments in transport and communications in Britain during the eighteenth and nineteenth centuries had profound consequences for the economy, society and culture. The railway's impact, for example, was noticeable by the 1830s and 1840s, most significantly in the increased speed of the trains with consequent dramatic reductions in travel times between places (Perkin, 1970; Thrift, 1990a: 463). The effect was to shrink national space. The 'annihilation of space and time' was a common term used to characterise the experience of railway travel in the mid-nineteenth century. The metaphor of 'annihilation' evoked the sudden impact and violence of the railway as it overturned existing notions of time and distance. On the one hand, the railway opened up new spaces and made them much more accessible. On the other, the railway seemingly destroyed space and diminished the uniqueness of individual places (Schivelbusch, 1977: 41). The uniqueness of place was further eroded by the introduction of uniform railroad time. Growth of the railway network, the consequent complexity of railway scheduling and the wish to avoid accidents, gradually made the existence of multiple local times untenable, and led railway companies to introduce 'standard time' along their routes (Bartky, 1989; Kern, 1983; Stephens, 1989; Thrift, 1981).

The railway was intimately associated with developments in communications technology, particularly the electric telegraph and the telephone. These technologies inaugurated simultaneous communication and a phase of 'time–space convergence' (Janelle, 1968; Falk and Abler, 1980; Harvey, 1989, 1990). Railway companies required first class communications and from an early phase in railway development the telegraph was used as a safety device and as a means of traffic control. The Great Western Railway used the telegraph experimentally in 1839. It was used throughout

on the Norfolk Railway in 1844 and during the same period on the South Eastern Railway. The telegraph, and later the telephone, was an important means of internal communication allowing railway companies to better manage their staff and complex operations. Telephone systems allowed the central office of a railway company to be in constant and immediate communication with every signal box, station, yard, office or other point in its organisation. The railway companies were also quick to take advantage of teleprinters and exchange switching technology, giving them greater flexibility and capacity to handle information (Ellis, 1959; Parris, 1965; Kieve, 1973).

Elsewhere, authors have speculated on the cultural and ideological consequences of new communications technologies. Carey, for example, argues that the introduction of the telegraph in America had profound ideological significance. The telegraph in America was dominated by Western Union, the first great industrial monopoly, which established the principles upon which modern businesses were managed. Carey suggests that the telegraph had a set of ideological consequences. Culturally, it brought changes in language, knowledge and awareness, leading, for example, to 'scientific' newspaper reporting, with news stripped of its local and regional context. By separating communication from transportation it changed the ways in which communication was thought about, for example, contributing to organic and systematic modes of thinking. Politically, it made the idea of 'empire' practically possible by allowing distant colonies to be controlled from the centre. Economically, it evened out commodity markets, diminished the significance of local conditions of supply and demand, made geography seemingly irrelevant, and shifted speculation from space to time, making possible the emergence of a futures market (Carey, 1983). Cronon usefully extends this argument and the metaphor of 'annihilating space' to the Chicago grain and meat-packing industries. He demonstrates how, in conjunction with the railway and the introduction of grain elevators and new technology in the abattoirs, the telegraph speeded up the delivery of goods to urban markets. The result was regional integration of the wheat and meat markets and the emergence of standard abstract product qualities, for example, September wheat, that could be easily traded on Chicago's stock market (Cronon, 1992).

As this last example suggests, it was a combination of technologies that gave nineteenth-century commentators the sense of a shrinking world. Hobsbawm describes, for example, how in the middle decades of the nineteenth century the world was unified by a combination of land and subterranean telegraphs, the construction of trans-continental railroads, steamship services and the completion of major construction projects such as the Suez canal (opened in 1869) (Hobsbawm, 1975: 49–67). It was these tremendous mid-century improvements in transport and communications that enabled Jules Verne to envisage his fictional character, Phileas Fogg, circumnavigating the globe in eighty days (a feat that would have taken eleven months in 1848) and for the results of the 1871 Derby to be transmitted from London to Calcutta in five minutes (Hobsbawm, 1975: 52–3). Improved communications in the nineteenth century were accompanied by greater global interdependency. The upside to this was the creation of a genuinely world market and significant reductions in the speed of movement of goods, people and information. The downside was the increased uncertainty of events and the threat of global slumps. The acceleration in the speed of communications intensified the contrast between those areas of the globe having

access to improved technology and those that did not: 'in widening the gap between the places accessible to the new technology and the rest, it intensified the relative backwardness of those parts of the world where horse, ox, mule, human bearer or boat still set the speed of transport' (Hobsbawm, 1975: 60). Greater global interdependency, a consequence of improved communications, increased the frequency of contact and the apparent contrast between technologically advanced and technologically backward regions of the globe, contributing to emerging nineteenth century ideologies of Western dominance (Headrick, 1981; Adas, 1989).

To summarise, time–space compression was apparent in Britain from at least the late eighteenth century. By the mid-nineteenth century, with the coming of the railway to Europe and North America, it was commonly experienced, and its effects were increasingly global. However the changes described above took place over several decades so that it would be wrong to view experiences of time–space compression in any one period as being revolutionary. It is also questionable how widely felt these experiences were. Writers, such as Schivelbusch, typically dwell on the dramatic episodes of technological change such as the coming of the railway (Schivelbusch, 1977). We learn that contemporaries' reflections on these events were captured by the metaphor of 'annihilation': symbolising, on the one hand, technological and societal progress, and on the other, the downside of rapid social and technological transformation. However Schivelbusch does not indicate how widespread these reflections were, whether they varied along gender and class lines, and whether the ideology of progress was espoused by specific social groups.

Advances in transport and communication were not limited to communications between places. This was equally a feature within cities. Beginning in the early nineteenth century European and North American cities constructed an infrastructure of pipes and wires for the systematic centralised distribution of fuel, light, power and information (Tarr and Dupuy, 1988). These early 'networked' or 'wired' cities may be regarded as forerunners of today's electronic or informational cities (Castells, 1989; Stein, 1996, 1999). Improved intra-urban communication is typically not discussed in academic treatments of time–space compression, and is generally under-researched and poorly understood. Moreover, detailed studies of the diffusion of new communications technologies often challenge exaggerated accounts of the effects of these technologies. During the nineteenth century, for example, the majority of telegraphic and telephonic communication remained local (Stein, 1999: 47–51). Similarly, Fischer's study of the diffusion of the motor car and the telephone in early-twentieth-century America shows that far from undermining localism, these technologies sustained it, by extending the volume of local and extra-local contacts (Fischer, 1992: 193–221).

5.3

On the move: technology, mobility, and the mediation of social time and space, by Nicola Green

The spaces and experiences of modern social life

One of the most significant developments of modernization across the 20th century has been the construction of the modern urban metropolis. In the modern city, the construction of urban spaces transforms previously continuous geographical locations into a series of fleeting places, images, and encounters in crowds (Simmel, 1997). The construction of modern urban space (including telecommunications infrastructures), by concentrating population and allowing for dense copresent but ever-changing interactions amongst centralized infrastructures, has contributed to a changing experience of time-bound social relationships. These have shifted from those of durable copresent interactions to fragmented and disconnected spatial and temporal connections. The spaces of the city separate "the private" from "the public," and institute locations (geographically defined spaces) and places (subjectively, socially, culturally, and geographically defined spaces) that have little connection with each other. Public social life therefore becomes an experience of discontinuity, where activities became compartmentalized in a series of fleeting encounters and impressions of little duration (Simmel, 1997; Frisby, 1985). Private social life, by contrast, becomes that of copresence, continuity, and proximity, instituting a divide between geographically defined public and private spaces.

Social and organizational activities in the newly emerging city required new forms of coordination, and technologies to manage it. Travel was one such set of technologies, as people became newly mobile and needed to coordinate times to meet or organize activities (Lash & Urry, 1994). The coordination of copresent activities via the technologies of travel required greater attention or orientation to (and discipline by) "clock time" as the prevailing organization of temporally based activities, including attention to measurable, calculable, and linear units of standardized time. The development of new production processes in industrialization and the role of clock time in new forms of work organization all helped institute new forms of time, centered around changes in interval, sequencing, and duration. The main thrust of these arguments is the move toward measurable, calculable units of clock time, standardized and shifting toward ever shorter time periods (Lash & Urry, 1994).

Lash and Urry (1994, p. 229) argue that the ascendence of clock time is attributable to such interacting changes as

> the disembedding of time from social activities as it becomes significantly stripped of meaning; the breakdown of time into a larger number of small units; the emergence of the disciplinary power of time; the increasing timetabling and hence mathematization of social life; and the emergence of a synchronized measure of life first across national territories and later across the globe with the development of Greenwich and "world time."

Simmel (1997) implies that the public life of the city in this case becomes an aggregation of privatized and individualized activities and agendas, bearing little relation to others. This particular development is detailed in du Gay et al. (1997) in their research on the Sony Walkman. In the case of the Walkman, private, subjective, and emotional geographies are mapped on to the public spaces of the city, transforming public space into a continuation of private, subjective experiences, rather than a collective of shared experiences. Cooper et al. (forthcoming, p. 4) suggest that "it is worth considering whether the increasing development and use of mobile technologies represents a kind of accentuation of the fragmented and individualized experience of modernity. Whereas it could be argued that the development of new tools and technologies are driving these changes, they reflect changing social notions of time more generally across the twentieth century."

As Lash and Urry (1994) note, it is not only the individual moving through city streets who experiences the changed times and spaces of modern urban life, but also the car, train, and bus travelers, who "transcend" what was formally understood as the "tyranny" of distance. Raymond Williams (1974, p. 26) identifies "mobile privatisation" as the contemporary experience of car travel:

> at most active social levels people are increasingly living as private small-family units, or . . . as private and deliberately self-enclosed individuals, while at the same time there is a quite unprecedented mobility of such restricted privacies . . . what is experienced inside them . . . is movement, choice of direction, the pursuit of self-determined private purposes. All the other shells are moving, in comparable ways but for their own different private ends. They are not so much other people, in any full sense, but other units which signal and are signalled to, so that private mobilities can proceed safely and relatively unhindered.

The increase in mobility, the development of temporal coordination, and the emergence of technologies designed to address the problem of "distance" in the city contributed to changing relations of physical presence and absence in newly formed urban spaces, and a changing subjective understanding of what Giddens (1990) calls "presence-availability." This includes both distance and proximity as related to physical copresence, as well as presence and availability as newly mediated via emerging technologies. The central argument is that throughout the 20th century, changes in physical proximity and distance – including the effects of technologies designed to address time and distance, as well as a shifting consciousness

of temporality – have "dislocated," "disembedded," and "disembodied" individuals from local, collective and copresent understandings of, and activities in, time, by "stretching" social relations.

However, if we turn to examine specific contemporary communications and information technologies, and the social relations that attend them, the general and universalizing arguments around changes in "presence availability" begin to look more problematic.

Spatial mobility, time, and telecommunications technologies

Marshall McLuhan (1964, p. 271) wrote, "The telephone is an irresistible intruder in time and space." Historical analyses have indicated that changes in temporal organization across the 20th century have involved changing relationships between natural, social, clock, and subjective time, as well as changes in space, mobility, and the boundaries of the public and private in the construction of the modern city. Other recent research has traced the specific transformations that have taken place with the introduction of different kinds of telecommunications and new information technologies. Social investigations of the "tele-presence" that the telegraph (Standage, 1998), the telephone (Fischer, 1988), and more recently the Internet (Boden & Molotch, 1994) have made possible have pointed to the central role these technologies have played in changing relationships across geographical space and time. Indeed, technologies such as the telephone are specifically spatial: Their sole function is to support social communication at a distance, and their ability to collapse distance has made possible many spatial features of contemporary urban life. The office towers of late modernity, for example, could not exist without the telecommunications technologies to coordinate their internal spaces (Pool, 1977; Townsend, 2001).

It is a well-established premise in social thought that the dominant technologies of a particular historical period define temporal organization and cultural understandings of it. Recent investigations of capital, industrial, and labor times (Thompson, 1967; Thrift, 1996; Rifkin, 1987; Adam, 1990), or "internet time" (Lee & Liebenau, 2000), are cases in point. According to some researchers (Ling & Yttri, 1999), mobile devices again reconfigure the spaces of urban social life. If mobile devices are "space-adjusting technologies" that provide resources for understanding a sense of place and relationship in both professional and private life, as Frissen (1995) suggests, then the changing times that attend changing spaces are also at issue. In research on the social aspects of mobile technologies thus far, for example, the notion of time flexibility has been a recurring theme, as has the "compression" of activities and relationships into more periods of shorter duration of communication (Townsend, 2001). There also seems to be an unprecedented level of simultaneous copresent and tele-present interaction made possible through mobile technologies (Cooper et al., forthcoming).

These concerns about duration, interval, and sequencing, as well as issues of presence, absence, and availability, are sometimes explained via analytical projects that concentrate on the specific changing temporal organization of new information and communication technologies (see, e.g., Lee & Liebenau, 2000). These projects describe changes in the context of spatial proximity and distance, such that changing activities are said to intensify to the extent that the subjective experience of time is

"fast" or "speeding" (an intensification of more and different activities of a shorter duration) (Virilio, 2000; Townsend, 2001). The decentralization of communication creates new webs of potential interaction between atomized individuals, which on the one hand increases the communication activities carried out, while at the same time fragmenting that communication into more numerous communications of shorter duration. According to Townsend (2001, p. 4), this is "dramatically speeding the metabolism of urban systems, increasing capacity and efficiency. The 'realtime city,' in which system conditions can be monitored and reacted to instantaneously, has arrived." Some theorists, such as Virilio (2000), therefore note the ways that the "speed" of electronic communications involves an immediacy of action such that movement in physical space becomes no longer even necessary. Lash and Urry (1994) also cite Nowotny (1994), who argues that the immediacy presented by new technologies of information and communication result in an experience of "instantaneous time." As Adam (1990, p. 140) notes, if all multiple activities in time are experienced as "instant" in this way, the future conflates with the present, concentrating and intensifying social action, entailing panic about and distrust of "the future" (Adam, 1990, p. 140).

For those who accept that the experience of time is "intensifying," "speeding up," or becoming "instantaneous," this type of change is attributable to a number of different factors. Harvey (1990), for example, attributes the "space–time compression" just outlined to the acceleration of the activities of capital over the 20th century, in which time and space both become abstractions and cease to have meaning or value in themselves; their meaning and value are instead determined by the circulation of capital, especially in commodification and representation. Giddens's (1990) view largely echoes Harvey's, but also considers how time and space "distanciate" as well as "compress." Although time–space compression (or "convergence" in Giddens's argument) describes shrinking distance in time (the span of time it takes to move from one location to another), "time–space distanciation" describes "the processes by which societies are 'stretched' over shorter or longer spans of time and space" (Lash & Urry, 1994). The structuring of time–space distanciation relies on such social relations as "presence-availability" – the organization of presence, absence proximity and availability, and the degree of copresent activities in relation to "tele-present" activities. It also relies on mediating technologies, such as information and communications technologies, and the control and storage capacity of them. These relations are interlinked, such that the relation of time and space may be routinized in different ways depending on forms of urban structure, the interaction of different transportation and communication technologies, the role of the state and surveillance of populations (Green, 2001), and the commodification of time in labor, industry, leisure, and consumption.

As Lash and Urry (1994) note, however, Giddens's and Harvey's theories rely on a largely generalized and universalized approach to "western societies" that tend to ignore the role of the specific and the local, and how changing times become routinised in mundane and habitual daily life. Several points in Thrift's (1996, pp. 1468–1469) critique of theories of new information and communication technologies are salient here: Thrift argues that these theories tend to argue from extremes; that the technologies are assumed to replace the ones that had gone before; that the

technologies are described as seamless systems without interruptions or limits, presented as coherent and consistent, without difference or locality; that the technologies are assumed to be likely to spread everywhere, quickly; that they are "rarely seen as a linked repertoire of practices"; that they are positioned in opposition to a distanced and controlled nature; and that they are mainly comprised of representation, rather than technical repertoires in use.

Doreen Massey (1993, pp. 61–62) adds that "power-geometries" are also crucial in the construction of space–time relations, and can be drawn out by asking *whose* mobility, *whose* times and spaces are under discussion:

> For different social groups and different individuals are placed in very distinct ways in relation to the flows and interconnections. This point concerns not merely the issue of who moves and who doesn't . . . it is also about power relation *to* the flows and the movement. Different social groups have distinct relationships to this anyway – differentiated mobility: some are more in charge of it than others; some initiate flows and movement, others don't; some are more on the receiving end of it than others; some are effectively imprisoned by it. . . . This is, in other words, a highly complex social differentation. There is the dimension of the degree of movement and communication, but also dimensions of control and initiation.

Massey argues coherently for analytical sensitivity to both geographical space and social and cultural locality in considering the relations of space–time. She argues for attention to the complex relations between space, locality, time, social organization, and culture, so that the heterogeneous effects of changing social institutions alongside changing technologies can be understood and "mapped." This argument emerges from a concern to (re)introduce notions that describe social and cultural difference, such as gender, ethnicity, and sexuality, to analyses of time and space. As an illustration, one story that we were told in the course of fieldwork pertained to the case of India, and was related by an educational anthropologist. After traveling several days to reach a small village in northern India, she spent time in the village looking at educational systems. While there, she came across the one person in the village who owned a mobile phone. This individual had made a business out of calling friends and relatives of villagers elsewhere (in the absence of any fixed line services), taking on the role once held by village letter writers. The notion of "changing mobile temporalities" has very different origins, and very different implications for these villagers, than they do for the "flexible schedulers" (like myself) in the West.

In summary then, sociologists have identified a number of overlapping times that both reflect and contribute to social organization, including various "natural" times and cycles such as diurnal, lunar and seasonal times, the calendar, clock, universal/standardized, and regional times that emerged with the development of the modern city, as well as the locally organized and lived times of the public and the private (such as "on time" and "off time") (Adam, 1990; Lash & Urry, 1994). They have also traced how various technologies have historically mediated these rhythms, and how technologies can have multiple temporal effects. As Massey (1992) and Thrift (1996) suggest, setting out the connections between presence, absence, proximity, distance, and "time–space adjusting technologies" entails attention to local and

situated temporal organization, as well as global and extended times. It therefore entails empirical research as well as theoretical pronouncements. While social activities mediated by mobile technologies potentially encourage fragmentation and the individualization of the experience of time, extending time–space "compression," "convergence," and "distanciation," and the speed and intensity of modern, Western life, locally shared rhythms and the social activities of lived times must also be accounted for. The emerging mobile times in their local and situated, as well as "global" incidence, can be usefully accessed via ethnographic materials.

The next section therefore outlines the relations we have encountered in our ethnography of mobile phones. They demonstrate emerging "mobile times" that must (increasingly) be considered in any theoretical discussion of temporal organization in contemporary Western societies.

Mobile temporality

I suggest in the discussion that follows that we might differentiate three sets of rhythms salient to "mobile time." It is the specific character of these rhythms that are important in the emerging organization of mobile times: the rhythms of mobile use; the rhythms of integrating mobile use into everyday life; and the rhythms of relation between use in everyday life and institutional social change. Rhythms of mobile use relate to the time taken interacting with a mobile device, and refers primarily to the duration and sequencing of interaction between an individual and that device (in this case, a mobile phone). Rhythms of mobile use in everyday life refer to the local temporalities associated with social and cultural relationships in which specific device use is embedded. Rhythms of institutional change refer to the historical and infrastructural elements that enable mobile use, including such dimensions as the institutionalization of travel, cycles of technological development, or the time taken to establish and maintain network technologies.

Lee and Liebenau (2000, pp. 50–51) suggest, in a study of the times of Internet use, that analytical attention should focus on the multiple "actors" of Internet systems – "the users (and uses), the publishers (and their servers), and the powers (including economic powers and regulatory or governance authorities)." If we are to account for potential social change brought about by mobile technologies, issues of access to and control over the temporal rhythms of mobility should also be addressed. Lee and Liebenau (2000) identify six dimensions of focus, including duration, temporal location, sequence, deadlines, cycles, and rhythms. I would add that these dimensions might also include the cultural and political dimensions of mobile use in everyday life. Our ethnography has been carried out over the past 2 years, and has involved fieldwork with groups such as those mobile in their working life, students, teenagers and their parents, as well as observation in main streets, in malls, on trains, and at train stations. Drawing on this research, I would like to illustrate such an analysis.

Rhythms of device use

The first dimension of analysis pertinent to the temporal organization of mobile devices is that of the temporal rhythms of the use of devices and their applications.

Most obvious here are the changing durations of device use for users. On the one hand, there is some evidence that mobile phones presently encourage short conversations, and introduce new opportunities for more conversation unavailable before. According to one teenager:

> It gets really confusing if you're talking to more than one person at a time. Cause if you forget what you said . . . Or you start writing to one person . . . Say like you're talking to one person and they're friends with one person that you're not . . . It gets into a big mess! And then someone phones you and when you're on the phone you can hear the beep as the message comes in. And you're like "I have to go. My bath's run." And you really just want to check your message. (A)

Ling and Yttri (1999) describe this as "micro coordination" and suggest that temporalities change as individuals engage in a kind of instant coordination when mobile, which could contribute to a subjective sense of speed, the intensification of tasks, and the fragmentation of communication. Teenagers use mobile phones in the same ways as adults for these coordinating activities:

> Just like cause I always ring my mum to tell her whether I'm walking home or whether I want her to pick me up. Just like pick up times and stuff and whether I'm staying late cause sometimes I help out and I teach. And also I use it at break times, and when I'm at work as well. (J1)

The use of short text messaging (SMS), especially among young people, might also support these arguments. Language in which words and phrases are abbreviated might contribute to interactions of much shorter duration than previously available, adding to a subjective sense of temporal fragmentation. Teenagers describe their use of language in these circumstances:

> You know, instead of "you are" you just put "u r," or "2" instead of "to." (G)
>
> With abbreviations it's more like a colloquial thing. As in who you're in with . . . It's the way you guys speak together anyway. (A)
>
> Like if you were talking to your Mum, you wouldn't write "CU." You'd have to write "See you." But if you're talking to your friends then you write "cul8r," because they understand it as well, they're like the same sort of . . . they understand the phones more than the parents do. (J)

The relatively short duration taken to read the messages is also involved. One mobile phone professional commented:

> I use it at work . . . but then when I message, it's to my friends, especially if I'm on the train or something . . . mostly its just one-liners . . . like a competition about who can come up with the best one-liner. (M)

At the same time, however, many teenagers reported that they spend many hours

a day (and night), sometimes hours at a time, short text messaging among their peers. These long durations act to consolidate their peer relationships, differentiate them from family or household relations, and contribute to a growing sense of both independence (from family) and collectivity (among peers).

> I'm just text messaging all the time . . . like the longest time I spent was about three hours. (G)
>
> It's a bit like text messages, they're addictive. (A)
>
> I can't sleep so I have to send a message to people. And then I get moody if they don't reply. I've got ones that are recorded at like three o'clock in the morning. (J)
>
> Text messages are things that you store . . . they're kind of memories you want to keep. It would be really cool to have like a memory card for each person so I can put all their text messages in there so I can retrieve them one at a time when I want them. (L)

Different forms of communication or device use also take on different meanings depending on the context of the communication in shifting peer relationships.

> I'd much rather phone someone, but you don't, because . . . you say things that you really want to say to them in text messages. (J)
>
> Yeah, there are some things that you don't really want to say to someone's face or on the phone to them. You just send a text. (A)
>
> Yesterday a friend of mine was asking me if I still had feelings for his brother. And it's like the minute he asked the question I knew it was going to be one of those text messages that keeps going to go on and on and on. (A)
>
> [Dumping people by text message] That is the worst way. That is like a bitchy thing to do. (J)
>
> It's worse than being a coward. Its worst when calling someone when you know they're a thousand miles away and going "oh yeah, by the way, you're dumped." It's terrible. (A)

This is supported by impressions from some of the parents:

> I suspect, I may be totally wrong on this one, but I think what is happening is that kids will sometimes say things in a message that they won't, like the heart sign and things like that. You don't go like "I Love you." She had this boyfriend in Liverpool . . . I suspect a lot of the messages were more like greeting cards, or soppy . . . I think if you want to say something like "Pick me up at the station," I'm not sure you would really message that, would you? It is something you need to get an answer to straight away.

Other features of device interaction reinforce this, such as time spent adjusting and sharing mobile phone address book entries (on a "who's got whose number" basis), or spending time showing friends messages that have been sent and received.

People will always just look at your phone . . . (A)

. . . and read your messages. (J)

But everyone does it. But the thing is it's like someone's diary. (J)

Yeah, I think its personal. I don't read anyone's messages. (A)

Only unless they show you. If they say "oh, look at this," then I'll look at it. (J)

It's the way you interact with each person individually, I think. So it reflects with the way you use their phones as well. . . . Even when they give you text messages to read I think that's boring when I don't know who's sent it. So, if it's a sweet message, I don't get it because I don't know the other person so it's just wasted on you. But if it's a funny one you go "ha ha! That was funny, who sent it?" (A)

As these examples show, the duration spent in interaction with the device, with other people, acts to both functionally and symbolically cement the durability of social relationships in local communities. In this case, the duration of "clock time" becomes a less salient feature of ongoing interaction with significant others through the device, than subjective time. The act of using the device, and the time spent doing so, might in this way contribute to a sense of social memory among groups. As Connerton (1989) notes, the minutiae of bodily habits with objects reinforce social and cultural memory. He argues that the use of artifacts literally "incorporates" those memories and relationships in the habits of the body. Time spent using devices makes relationships durable and ongoing, rather than "fragmented."

The durations and sequencing of device use also have durable meanings for organizations such as device manufacturers. Certainly, device manufacturers study the "usability" of their devices in terms of the actions of the body and the duration of time taken to complete specific tasks. This temporal measurement contributes to the design of devices, and these times become durable, literally "objectified" in the devices themselves (such as measurements of the time taken to write text messages on a mobile device, leading to the development of predictive text software).

The results from teens just cited indicate that in the case of design, the measure of duration of activity as a measure of significance for the "usability" of devices may not be as salient as previously thought. Located practical action also has bearing on the duration and sequencing of functions: In many settings for example, we observed pedestrians on main streets or in malls coming to a standstill in order to use some of the functions on their mobile. They were compelled to become immobile to use their mobile device.

Moreover, our interviews with sales and marketing personnel in network operator organizations indicated that network operators record times and intensities of network activities both for billing purposes, and thereafter use the information to build a picture of their consumers. If duration is significant in local ways, network activity, the mathematization of categorization of users into high-use/high-value, low-use/low-value groups as an indicator of consumer practices, might belie changing social patterns of communication and changing patterns of sociality. Perhaps what is more salient is the relationship being maintained through those time-bound activities.

Rhythms of everyday life

These aspects of device use are integrated into emerging patterns of organizing mobile communications and relations in everyday life. One aspect of temporal location significant for users (and for service providers) is the "anytime, anywhere" availability provided by mobile devices, which integrates microcordination and device use discussed earlier with the rhythms of work, family, and leisure times (Green & Harvey, 1999). For users, the always-availability implied by mobile time and space affects the sequencing of life tasks, deadlines organized around work and home activities, the cycles of work, leisure, and family life, and the rhythms of diurnal, lunar, seasonal, and calendar change – all of which have social implications. The case of Catherine, a sales representative whose work communications are primarily conducted via her mobile phone, is illustrative.

> My mobile is my life . . . well, my car and my mobile. I live in the car. I'll use the mobile for work calls at home in the morning, and then when I'm driving as well, to report back to the office about visits, or to make queries on orders, or whatever . . . I use it to call friends when I'm on the road, but mostly when I'm stuck in traffic jams. If someone rings I'll take the call . . . but mostly, if I'm stuck, I'll ring my Mum. My Mum and I talk quite a lot most days.

Although Catherine's life remains, at least in part, structured through formal or clock time (for example, she regulates work time into compartments of daily and weekly duration), decentralization of both her work and home life prompts flexibility and individualized scheduling. The mobile phone interrupts the time-based coordination of communication and information activities required for scheduling from fixed locations. Individuals may thus organize their activities around flexible compartments of time, rather than compartments of time associated with particular geographical spaces.

At a mundane level, there has been significant research on the "always-availability" of mobile temporality (Green, 2001; Green & Harvey, 1999; Brown et al., 2001.) – to be always and at every time "on call" – and its potential to transform the ways that individuals organize their activities in time and the ways they arrange their "schedules." A kind of spatial and temporal "boundary rearrangement" becomes possible, and has begun to appear in our research. This involves both the case of "public" activities and responsibilities (as in the case of work) that become embedded in the temporal rhythms of the home, as well as "private" relationships becoming integrated into the public sphere in mobile relations.

In the former case, research has tended to concentrate on how mobile teleworkers organize their work and home life, and Ellen Ullman's (1997, p. 136) work echoes the findings of our own research:

> It's not surprising to me . . . [m]y work hours have leaked into all parts of the day and week. Eight in the morning, ten at night, Saturday at noon, Sundays: I am never not working. Even when I'm not actually doing something that could be called work, I might get started at any minute. So everything is an interruption . . . everything must be refused because it is possible that from one moment to the

> next I will get back to something. . . . The building I live in . . . is full of little one- and two-person companies. . . . In the afternoons, I see us virtuals emerge blinking into the sunlight. In the dead hours after 3 p.m., we haunt cafés and local restaurants. We run into each other at the FedEx drop-box or the copy shop. They, like me, have a freshly laundered look, just come out of pajamas or sweat pants, just showered and dressed.

It is this time-based (rather than space-based) organization of activities that defines "accessibility," a redefinition of "public" and "private" time into "on time" and "off time." Laurier (1999) suggests that using the technology to its full potential can, precisely, help individuals to control time, and thus to control the organizational relationships of which they are a part. The decentralization of work activities, and the practices of "assembling the mobile office" on the part of "nomadic workers," entail the simultaneous management of private activities, as when mobile teleworkers coordinate their work life from/at home (Steward, 2000). "Public" work activities are drawn into "private" spaces, with a variety of effects on an individual's home and family life. Nevertheless, while this temporal boundary rescheduling might positively produce spatial and temporal flexibility for users, this is not necessarily the case (Steward, 2000).

Some research, including our own, has indicated that mobile teleworking can have negative effects for workers and families when they have been compelled, rather than chosen, to work in this manner. Hill, Hawkins, and Miller (1996), for example, investigated the domestic effects of mobile telework. In a quantitative and qualitative survey, the private contexts of mobile use for telework were examined, and teleworkers reported that the flexibility to be permanently available for work impacted on their personal and domestic life such that they had *less* time for their home and family. The advantages of mobility and "telepresence" were, for those surveyed, sometimes offset by the drawbacks of permanent availability for work. Debbie, a student who is also a mother, and works for a charity, says:

> I always try to turn my mobile off on the train. I mean, its like, if you don't then there's always something . . . always someone trying to get hold of you. . . . I mean apart from it being really boring having to listen to other people's conversations . . . and I *like* having that journey, it's time to myself, on the train. If you're going to places, on your way to places, then people can't get hold of you if you don't want them to.

These effects were also strongly influenced by their degree of choice in "becoming mobile." Mobility was perceived negatively when individuals had not chosen to undertake their work via mobile and telepresent means, but were required to do so by their employer. It seems that mobile teleworking and the temporal rhythms as well as geographical locations involved have different effects for users depending on their levels of access to and control over mobile work activities and their status as mobile teleworkers.

Such issues of access and control of mobile activities draw attention to the differential effects of mobile technologies for different users. If we are to consider Massey's

(1993) notion of power geometries, we need to ask who has access, who has control of time, and who doesn't, in emerging mobile temporalities. This is also at issue in instances where the temporalities of private relations are potentially shifted via mobile technologies into public life.

We have encountered numerous instances in our research where the use of mobiles in public space has been employed to maintain "private," family, or community relations. Young people, especially young women, will use devices to maintain relationships with significant others both while traveling alone (to avoid encounters with strangers) and at specific times (such as late night, or "when it's dark"). Their marginalization in public space, at specific times, leads to their increased use to the device to maintain contact with significant others. The mobile therefore has different uses and effects for these groups than for others.

> It's a security thing, kind of. (S)
>
> Yeah, whenever I'm walking somewhere and I'm really scared I have like 999 [the UK emergency number] dialed already. I just have my finger on the button. (L)
>
> When I used to finish work and I'd be walking to Claire's house or something, . . . I'd always phone Paul so I could speak to him while I'm walking so I'm not quite so scared. (S)
>
> I mean a lot of parents buy their phones for their daughters anyway . . . or maybe sons, 'cause they want to know where they are, keep in contact and they can ring whenever. (P)

This theme of mobile technologies creating the subjective experience of being "in touch" or connected when alone at specific times is beginning to loom large, and also indicates that a gender analysis is crucial in the experience of everyday rhythms of mobile temporality.

At the same time, relationships between teens and parents can also become fraught with anxiety when mobility becomes mapped on to the teenager's struggles over autonomy, and this often has specific temporal aspects (such as curfews). Teenagers who buy pagers to stay in contact with their friends (at any time) become frustrated when parents use those technologies to contact the teenager and monitor their activity in space and time:

> My mum used to be like that, and hates them, but she always wanted to know where I was, so . . . that's what I don't like. Everyone knows where you are all the time, that's why I don't like them. (D)
>
> You don't tell them where you are! (G)
>
> I'll be out, and I'll go to my friend's house . . . until really late, and mum would get worried, and I won't phone home . . . and so they're all getting all stressed, and "you're not going anywhere again," and with the phone they can just say "oh, what time are you coming home, are you all right, blah blah." (G)
>
> Sometimes they [ask where I am]. If I say "I'm going there," they'll think I'm still there, and stuff like that. . . . Or I won't say, I'll say "I'm just out with one of my friends." (H)

> If you say you're at a friend's house then they know you're there, they think its better . . . because they can try and call you on the house phone 'cos that's where you're supposed to be, so they'll try and call there, 'cos then they know where you are. (G)
>
> You just lie. It's just lying. (H)

For parents then, mobile technologies may assist in the temporal ordering and regulation of individual and family activities. Parents have also, however, talked about disruptions to the temporal rhythms of domestic life caused by mobile phones in our research. Some are convinced that teenagers who call their children in the early hours of the morning would not do so on a fixed-line phone for fear of disrupting the temporal rhythms of the household. There might also be differences in the social implications of "always-availability" on the part of parents. When we consider that women have demonstrably invested more time in the maintenance of familial and intimate relationships via telecommunications devices (Rakow, 1992; Rakow & Navarro, 1993), it would seem that being "always available" for home as well as work activities via mobile devices may have significantly different effects for women and men. One mother says:

> I like to feel, not that I can instantly get hold of her, but that she can get hold of me. . . . But having said that I think I get more calls like can I go and pick her up, "I've just missed the last bus." In that sense I think it creates more work for parents.

In summary then, the personalization of mobile device – their attachment to an individual person/body and their temporal rhythms, rather than to specific locations, the personalized nature of the technologies and the attendant atomization of communications – can then potentially fragment both "public" and "private" communication activities, collapsing each into the other. Being available, being connected may be seen as a strategic form of social behavior that enables participation in a preferred and familiar social space no matter what the immediate surroundings may be. At the same time, when all social activities become coordinated through the same device, what time is on and off, and when, for what, becomes a primary site of negotiating social relationships and conflicting roles in everyday life. The issues of who has access to and control of mobile devices (or not), and when, seem the central issues in the local organization of mobile temporality.

The relations of everyday life just described should be seen in the context of the temporal rhythms that regulate and inform the practices of network operators, service providers, and governmental and regulatory authorities. On the one hand, there are the specific temporal cycles of the present cellular (and potential satellite) infrastructures. Cellular networks go through regular cycles of call loads, regular times when the network is "busy." Furthermore, the temporal location of the cellular infrastructure in any particular place will also affect who can call whom, where, and when. Long-term cycles of infrastructural development, including decisions about where to locate physical cell sites (masts/antennae), how many, and when, go through regular cycles of strategic planning and development, which depend on the different contingencies of

the network operators' schedules. The rhythms of the technical infrastructure do not depend only on technology development, however. They are also determined by the monthly, quarterly, and yearly rhythms of the financial calendar, and how particular organizations organize strategic analysis, market development, and the (sometimes overlapping, sometimes contradictory) programs of business planning and management. While linked to longer term technical and social change (discussed later), these temporal aspects of mobile organization affect how mobility takes place in everyday life for users (who gets to connect and when), and also determine the daily, monthly, and yearly scheduling and deadlines within operator organizations.

Rhythms of institutional change

The temporal locations, the deadlines, cycles, and sequences of the technical infrastructure, and the organizational temporalities related to its planning and development draw attention to the time scales involved in the relationship between technical development in industry organizations and government and policymaking processes.

Although ostensibly in competition, industry actors often coordinate their interaction with public authorities in time, affecting both the nature of technical infrastructures and the networks and services available to consumers. The process of formulating network standards and the governmental regulation of business activity and auctions of network bands are examples of standards setting, regulation, and policymaking processes that are situated in time. The yearly schedules of when governments meet and policy is set, the regular cycles of civil service regulation, and the product and service development attendant upon them in corporate organizations all have impact on the technical and economic times of mobile development.

Certainly for industry players, time is money, in this sense. Or perhaps, as Barbara Adam suggests, money is time (1990, p. 114). One thing that is certain in the mobile industry, as elsewhere, is that time itself has become a commodity – hence the value of mobile devices and services in markets. Once time becomes a commodified resource (we can "save" and "invest" time, for example), it becomes not only disembedded from related value, but disembodied from any specific activities in daily life. It is only in this culturally specific connection between time and money, for example, that cultural perceptions of "wasting" time, of "dead time," become influential. Perry et al. (2001) have suggested, for example, that mobile devices act as "Lazarus" devices – devices that "resurrect" mobile time that would have previously been considered "dead," "economically unproductive" (such as time taken to travel from one place to another). This implies that an emerging mobile temporality is "Lazarus time," productive time that has been resurrected from unproductive "dead time" via the use of mobile technologies. The implication that time is money is relevant not only for those in the mobile business, therefore, but also for the mobile temporalities of users. According to Townsend (2001),

> time becomes a commodity to buy, sell, and trade over the phone. The old schedule of minutes, hours, days, and weeks becomes shattered into a constant stream of negotiations, reconfigurations, and rescheduling. One can be interrupted or interrupt friends and colleagues at any time. Individuals live in this

> phonespace – they can never let it go, because it is their primary link to the temporally, spatially fragmented network of friends and colleagues they have constructed for themselves. It has become their new umbilical cord. (p. 70)

"Institutional change" in the form of mobile temporality, therefore, is not only related to the governance of social institutions or the dominance of corporate business, and the "convergence" or "distanciation" to the infrastructural elements of whole societies (although the importance of these elements has, I hope, become apparent). Nor does it only lie in changing technical infrastructures and the social implications they might have for changing temporality when mobile. Nor is social change simply related to the changing daily activities of individuals as they reschedule and become flexible. To consider the implications of mobile temporality for social practices, understandings, and organization of time is also crucially to consider questions of value. Who gains what through mobile temporalities? Where, and under what local and collective conditions?

Conclusions

Many sociological arguments have been made for new temporal formations through the use of new and mobile information and communication technologies – the "timeless time" of Castells (1996, p. 433), Nowotny's (1994) "instantaneous time," Virilio's "speed" (2000), and Giddens's "time–space distanciation" and "convergence" (1990). The logic of these arguments would suggest that a reconfiguration of space and time is taking place, a rearrangement that entails the individualization and fragmentation of availability, duration, cycles, and rhythms, such that the forms and purposes of the communication and the social relationships mediated and maintained through them are reconfigured.

Certainly, arguments about mobile work, flexible scheduling, changes in the duration and cycles of activities, proximity, distance, and presence might suggest that widespread social and cultural change in the practice and understanding of temporality is occurring. While the "speed" of modern urban life and potential fragmentation in social relationships via temporal changes can certainly be noted, mobile technologies also introduce opportunities for new continuities across space and time, previously disjoined through centralization. The ethnographic data presented here have been one means to address these new temporal continuities.

Furthermore, I have argued here that if attention is paid to local and situated times, to the rhythms of daily life as well as the cycles of social organization between groups of social actors detailed in analyses such as those of Giddens and Harvey, many temporalities (the social practices and understandings that form them, the activities and relationships they mediate and maintain) can be demonstrated to be relatively enduring. At least some of the relationships that comprise mobile temporalities – including those of organization and regulation – are not dissimilar (or have not changed) from well-established temporal patterns in the production and reproduction of technical and social infrastructure. What is at issue is how different temporal rhythms intersect in new ways as they are configured in different locations, and in everyday, situated action.

If we can think of social "space–time" as the network of relationships within which individuals and groups operate in everyday life, social time is comprised of the social (rather than geographical) proximity of those relationships, as they are shaped by resources, location, value, and knowledge. The simultaneity of copresence and telepresence becomes the mechanism for connection with others. The device and its functionalities can stand in for, but can also create, a community or network. On the one hand, social space and time are "extended," and on the other, they remain locally continuous. Communities are being formed in highly contradictory ways, which reflect new disjunctures, as well as new continuities, in the relationship between space, time, and location.

What seems most at issue is not only the fact or extent of temporal change in the face of mobile technologies, but also the situated, differential effects of those changes for different individuals and social groups. These are not only descriptive questions (what has changed and how?) but also qualitative questions (with what consequences, for whom?). When the value of (mobile) time is taken into account, these questions become more pressing. The connection between mobile space and time, as articulated in multiple, heterogeneous places and rhythms, is not constant and does not have equal effects for all. Access to and control of time and mobility are always shaped by the context of situated social practice, as collectively created and maintained by a number of different individuals and social groups. In asking who benefits from these heterogeneous causes and effects, we are asking questions about the power geometries of mobile time.

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5.4

Time and the internet,
by Heejin Lee and Jonathan Liebenau

3 Time and computers

There is not much research that addresses time and computers substantially. However, the topic is already attracting the attention of researchers from various academic disciplines. Negroponte (1995) mentions the impact of electronic mail on work time. Electronic mail changes the rhythm of work and play:

> Nine-to-five, five days a week, and two weeks off a year starts to evaporate as the dominant beat to business life. Professional and personal messages start to commingle: Sunday is not so different from Monday. (p. 193)

Electronic mail also can make people less sensitive to international time-zone differences (Failla and Bagnara, 1992: 672). Negroponte gives another example (p. 49). The 'nine o'clock news' has a special meaning in everyday life over almost all the world. Some people are keen to arrive home by then, especially when a big issue is in the news. The time of 9 p.m. functions as a reference time for them in organizing their day. Cable TV news networks such as CNN cause the time 9 p.m. increasingly to lose its meaning as a temporal reference point because they repeat updated news every 15 or 30 minutes. The Internet can accelerate this trend. On the Internet, one can retrieve and watch news when one wants, not when it is delivered by broadcasting companies. Once this practice is generalized among the population, 9 p.m. is no longer different from 8:17 p.m. Then the lifestyle which employs it as one of its important temporal anchors (e.g. 9 a.m. for starting work, noon or 1 p.m. for lunch, and 5 p.m. for calling it a day) will be transformed. In these ways both the seven-day week and the currently patterned day are weakened by the Internet.

According to Failla and Bagnara (1992), information technology causes profound changes in the time-frame patterns of the decision-making process. It also eliminates rigidity in work rhythms, giving flexibility. The organization of work is becoming less and less rigid in terms of time-patterns. This is especially true of professional work performed in offices with information technology support. The application of information technologies to knowledge-based activities

> . . . generates work methods that cut across the 'traditional' sequence of events, changing the durations customarily regarded as 'appropriate' and reducing the need to 'program' activities, and hence to resort to rigid timetables. The effect of these changes is to disrupt the traditional work rhythms. In this sense, information technologies help to eliminate or diminish the importance of time-frames generally accepted as appropriate for performing a given activity.
>
> (Failla and Bagnara, 1992: 678)

The impacts of information technology on time assume different patterns depending on the stages in the development of information technology. Failla and Bagnara classify its development into three stages: the automation of routine activities, decision support technologies, and virtual reality technologies. Each stage has a different meaning in terms of time.

In the automation of routine activities at the early stages of computerization, there still remains the same high degree of rigidity in work rhythms. Such high rigidity characterized the mechanical technologies of the first industrial revolution. In this phase users complain that computers dictate the rhythm of work. They are required to adapt to machine time. Some attitudes of resistance to computers can be attributed to the disorientating effect of the 'new' rigid time-frames imposed by the technology. The next stage is characterized by the proliferation of direct users of information technology generated by the advent of the personal computer. This phase sees the development of information technology for individual decision-making such as spreadsheets, databases and packages for statistical analysis. Although these technologies for decision support systems result in changes in decision-making processes, the most significant transformation is their disruptive effect on rigid time-frames. Due to the decentralization of processing capacity through the personal computer and the subsequent development of specific applications to support individualized decision-making, a new relationship with technology has been generated. The relationship is no longer subject to the time constraints of centralized systems. When the technology evolves from supporting individual decision-making, to aiding organizational decision-making such as group decision support systems (GDSS) or computer supported cooperative work (CSCW), bigger impacts on time are expected. At present, information technology is experiencing another phase of development which is likely to have a qualitative impact on time. The new technologies make it possible to project a virtual reality environment, and help us to simulate the consequences *in advance*. The decision-making process has always been based on *past* experiences. With this technology, however, we can gain experience of scenarios or events that have never been encountered in real life. Virtual reality technology therefore allows 'future' or unexperienced experiences to be experienced. We can reconstruct the experience needed to generate alternatives with the help of information technology. It allows simulation of the future and thereby modifies the time-frames which are no longer relegated to repetitions of the past with little variation.

There are empirical studies on time and information technology in organizations. Barley (1988) investigated the impacts of computer-based radiology equipment on temporality and social relations in hospital radiology departments. He found a

dichotomy in ways of organizing time: monochronic and polychronic ways (Hall, 1959, 1966, 1983). In the former, people do one thing at a time; in the latter, several things are done at once. Barley found that the new computer-based equipment increased the monochronicity of radiologists' work by restructuring the duration, sequence, temporal location and rate of recurrence of events. It in turn enhanced the symmetry of temporal organization between radiologists' and technicians' work. Furthermore the increased symmetry contributed to decreased conflict between radiologists and technicians.

Lee (1997, 1999) further developed the points made by Barley. He suggested six dimensions of temporality in business processes: duration, temporal location, sequence, deadline, cycle and rhythm. They were used to describe and analyse temporal changes in the work under study. In his case study, information technology transformed temporal profiles of work and also created a temporal symmetry between work groups interacting with each other. Unlike in Barley's study, however, the main direction of change was polychronic.

4 Temporal dimensions of the Internet and corporate intranets

We can simplify the features of the Internet and other networks such as internal corporate networks that can be analysed for a new temporal view. These features can be described in terms of the users (and uses), the publishers (and their servers), and the powers (including economic powers and regulatory or governance authorities).

Users have the opportunity to alter their temporal perceptions by virtue of having access at any time. That access gives the illusion of being instantaneous. Users are assumed to have short attention spans, and this has influenced the design of much material. The experience of television holds strong sway over the style of presentation.

Internet servers are (supposed to be) always switched on. Their constant presence means that all materials are always available, and in aggregate the Internet is as accessible in the middle of the night as at the height of the working day. The burden of costs is shifted from consumers to publishers, the owners of infrastructure, and those who attempt to govern the Internet. This current state is not symmetrical with the distribution of powers, which is more difficult to assess, since they are spread among suppliers of hardware and software, other standards setters, and a small number of companies, including the largest Internet service providers and search engines.

We can apply the analytical dimensions of temporality to the Internet and other networks to discern a structure in the confusing variety of features. This then provides us with the opportunity to differentiate researchable features, some of which lend themselves to measurement or direct comparison across situations where different users or distinct uses can be assessed.

Duration

The notion that the Internet provides instantaneous access to a world of information is a useful fiction. There are, however, two ways in which we might regard the concept of duration as applying: in the ways in which users typically go about locating and

browsing materials, and in the real experience of viewing identified sites. It would be better to recognize that there are lag times in accessing and downloading sought-after material and that this often causes frustration and sometimes expense. In that sense we can regard the experience of using the Internet as one of pseudo-instantaneous access.

The style of web surfing that is currently common is another sense in which duration plays a role. As we have learned from our behaviour with television, the shortening of attention spans and the preference for short bursts of superficial material have altered the way we regard material on the Internet. We are unlikely to feel the same need to sustain our attention for long periods, as we do when we read a book.

Temporal location

The Internet is 'always on'. We can access it at any time and real business can be transacted independently of any cycle or working period. This is not a unique feature of the Internet but since it is the case with all users, unlike, say, automatic trading systems, it stands out as a distinct shift. Increasingly, dedicated networks are also being used independently of their location and corporate intranets have been especially useful for geographically dispersed companies as well as temporally dispersed users. This has been interpreted by some to mean that employees will face 24-hour demands to work, but this is not yet discernible as a real trend.

Sequence

One of the most vexing problems of the early days of the world wide web was the confusion of sequencing which users experienced. The concept of 'navigation aids' was the means to address this problem of users feeling lost, and other common features include files which show the 'history' of a search. However, the fundamental problem of sequence appears mainly because of the facility of 'hypertext', which was designed to provide an alternative to linear reading. This loss of linearity is both a physical and a temporal change because, although searching is still temporally linear in a concrete sense, it loses that feeling of continuity for users much of the time.

Deadlines

Deadlines are a constant, static presence in our working lives. Usually dictated by procedure and governed by traditional practice, they solidify our schedules. We can observe, however, that Internet applications shift the concept and allow us, at least, to renegotiate our structure of deadlines. It is largely the features described above, the differences in duration, temporal location and sequence, which provide the opportunity to place deadlines at different positions in the course of a task. This was studied in detail in the case of temporal shifts at the Korean electronic trading system, KTNET (Lee, 1999) where daily routines were radically shifted by the changes in deadlines that were applied to business procedures.

Cycles

Interaction among collaborators is traditionally cycled by a combination of day/week/month/year demarcations and task cycles. As duration, sequence and deadlines shift, new cycles are allowed to appear in using networks. These can be constantly renegotiated as befits the task, and there are possibilities of charting and managing numerous simultaneously operating cycles.

There are also cases where the concept of cycle is radically altered, as when global organizations engage in the continuous production of products such as software. Some developers have structured production such that procedures are smoothly handed over from workers in Hong Kong at the end of their working day to their colleagues in London, who then hand over to colleagues in California. This allows for almost constant work on a single product, uninterrupted by normal daily work cycles (Gorton and Motwani, 1996).

Rhythms

The rhythms which guide us, the alternations between work and play and the ways in which we split the day, set up patterns which inculcate themselves into our lives. Such rhythms of 'busy-ness' also shift when we use electronic media to take advantage of the opportunity to condense or disperse our working effort. Since different people are 'busy' at different times, the collaborative character of electronic work can be controlled by each individual. E-mail provides a similar opportunity because it allows us to change our working rhythms. We can accumulate messages, or even messages of one particular type, and become 'busy' with them at a chosen time.

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5.5

Speed is contagious,
by Thomas Hylland Eriksen

This holds true in the media, as elsewhere. The fastest media, at the moment television and Internet newspapers, are being imitated by the printed media. The articles become shorter and shorter, with clearer 'messages' and less analysis. Dedicated news channels on radio, for their part, boast that they update their news every hour, while the WAP format epitomises everything that is fast in contemporary mass communication. WAP phones and similar devices have a 'screen' which is about twice as large as the display of an ordinary mobile phone, as well as direct access to limited sectors of the Internet. One can, for example, check the stock exchange rates, the evening's cinema programme, the news headlines and the e-mail on a WAP telephone, and the superbrief news items are updated virtually continuously. In the bad old days, one had to wait until the TV news in the early evening for an update.

It is not unlikely that this kind of technology will become widespread. In a situation with an information surplus, everyone has 10 seconds to spare, but very few have a whole minute. This gives a competitive edge to the fastest and most compact media. A general rule of the information revolution is that in a 'free and fair' competition between a slow and a fast version of 'the same thing', the fast version wins. The question is what gets lost on the way. The short answer to this question is *context* and *understanding*; the longer one involves *credibility*. It is hard enough to edit a credible daily newspaper, which, among other things, attracts readers through being first with the latest. But, as a senior editor of a major broadsheet mentioned to me during a fast and fragmentary conversation on a streetcorner: just imagine being managing editor for the WAP edition of a newspaper, which demands continuous updating! One would scarcely have the time to type the news before it was published and therefore in need of revision. This situation is just around the corner as I write this.

Ramonet claims that during the last 30 years, more information has been produced than during the previous 5,000 years! He illustrates the point with an example: 'A single copy of the Sunday edition of the *New York Times* contains more information than a cultivated person in the eighteenth century would consume during a lifetime.'

I have no way of knowing whether performances of Beethoven's sixth symphony,

the idyllic *Pastoral* symphony, are much faster today than the performances of 200 years ago. But as already mentioned, plays have accelerated very noticeably during the twentieth century. A political scientist recently studied the development of the annual financial debate in the Norwegian parliament, comparing the speed of speech in selected years from 1945 to 1995. He shows that the members of parliament spoke at an average velocity of 584 phonemes per minute in 1945. In 1980, the number of sounds had risen to 772, and in 1995 it had reached 863. In other words, the average politician spoke 50 per cent faster in 1995 than his or her predecessors did in the mid-1940s.

Or one could put it like this: it is as if one lives in an old, venerable but slightly dilapidated house and decides to refurbish the bathroom. Having finally done this, a poorer but hopefully happier person following a budgetary deficit worthy of the United Nations, one discovers for the first time that the kitchen is really quite run-down. So one begins to tear out the old kitchen fittings, and soon enters a new frustrating round of phone calls to plumbers and masons. Then one is bound to discover, almost immediately, how old and worn the hall is, and really, wouldn't it be a terrific idea to give the living room a coat of paint and a new floor? Speed is contagious in an analogous way.

If one gets used to speed in some areas, the desire for speed will tend to spread to new domains. Five minutes spent waiting for the bus lasts longer the faster the airport express train takes you from the terminal to the bus stop. As computer networks have become faster, many of us have grown accustomed to an Internet connection where waiting time is in principle, and often in practice, minimal. Still, we will not rest content until the web pages are accessed the very same moment we press the button. Two seconds of waiting time today is as unacceptable as 10 seconds would have been a couple of years ago.

This principle has a general validity. If the plane from Oslo to Copenhagen takes 40 minutes, 15 minutes' delay makes a lot of difference. If, on the other hand, one chooses to take the boat, which takes an evening and a night to cross the Skagerrak, 15 minutes lost or saved makes little difference, since the rhythm of the boat militates against petty time-saving schemes. Other activities can wait. Fast time, in other words, is contagious both between persons and between life domains.

Gains and losses tend to equal each other out

In 1965, the engineer Gordon Moore spelled out the principle that has come to be known as 'Moore's Law'. It states that the capacity (read: speed) of microprocessors is doubled every 18 months. (Recently, it has been supplemented by 'Gilder's Law', which states that the transmission speed – bandwidth – on the Net is doubled every year.) So far, Moore has been right. However, a computer scientist at my university supplemented Moore with 'Knut's Law'. It states that Moore's law is correct, but that computer software doubles in complexity and size every 16 months. According to Knut, then, the daily chores performed by any computer nowadays take *longer* than before.

Knut is obviously a witty man, and he exaggerates. (Actually his law reminds me of a newspaper story from a few years back, on the assumed health benefits of jogging.

It noted that people who jog do live longer than others – on average, exactly as much longer as the time they spend jogging.) But in a general sense, Knut is right. Allow me to illustrate with a few examples from my own computer world, which is called Macintosh. The first version of the word processor MacWrite, launched in 1984, took a little more than 50 Kb of disk space (disks back then, remember, took all of 400 Kb). The program I am using to write this book, WriteNow 4 (that is, the 1994 version), takes 348 Kb of disk space. The latest version of the world's most popular word processor, which is Microsoft Word, requires 5.1 Mb, in other words well over 5,000 Kb. And for the program to function properly, a heap of additions are needed. Some of them are shared with the sister programs Excel and PowerPoint. Altogether, Microsoft's office package requires more than 100 Mb, and most people install all programs.

In the old days, that is a little over a dozen years ago, the total capacity of an ordinary hard disk was 20 Mb. We felt we had a lot of space back then, we who had grown up with computers without hard disks! We might have a word processor such as MacWrite (50 Kb), a presentation program like More (384 Kb in the last and best version) and a spreadsheet such as CricketGraph (200 Kb) at our disposal, and were able to perform the same tasks that an average user of Microsoft Word now needs more than 100 Mb of disk space to perform. Naturally, he or she also needs a much faster computer than we could even dream of at the time.

So the software has been improved? That depends on what one is after. Personally I prefer the simple and stable programs. They are easy to learn and straightforward to relate to, and although I write hundreds of pages every year, I never seem to need more than what humble WriteNow is able to offer. Yes, Word does make it possible to make tables of contents and fancy templates, and to run a number of functions automatically through macros; but in my experience, it is easier to tailor documents to one's special needs as one goes along. The simpler a computer program is, the less time and energy is spent on relating to the actual technology and trying to read the thoughts of the programmers, and more concentration can be expended on the task at hand. The larger and more complex a program is, the greater the risk of crashes and breakdowns. Irritating macro viruses have in recent years become widespread among computer users, but only among Word users.

This is to do with too much complexity of the wrong kind. Increased speed does not even necessarily make us more efficient – a point to which I shall return later. The magazine *WIRED* ran a story a few years ago about the new CEO of mighty Sun Microsystems, and how he wanted to improve the efficiency of his staff. He came up with several ideas, but one in particular took the computer addicts on the staff by surprise. Now, many of the employees routinely made transparencies for use in external and internal presentations of what they were up to. As an aid, they had loads of templates, illustrations, suggestions and previously used presentations lying around on the shared hard disks of the company. While working on a particular presentation, people would browse these files to look for ideas, suitable templates, etc. The CEO found out that there were altogether 12.9 gigabytes of PowerPoint stuff on the servers. He deleted everything. From now on, the staff had to make their own presentations from scratch. And indeed, they now worked more efficiently, and spent less time on each transparency than before.

Technological change leads to unpredicted side-effects

All technology has unintended consequences, and whenever one gets more of a particular kind of technology, the result is not necessarily 'more of the same'. It could just as well be 'something entirely different'. One telling example is the transition from single-channel (or, at any rate, two- or three-channel) television to multi-channel television operated by a remote control. In most European countries, this change has taken place since around 1980. National television is a fantastic tool for propaganda – or, put differently, it can create a very powerful, shared national identity. It communicates directly, simultaneously and emotionally to literates as well as illiterates. It synchronises large segments of the population, and presents a particular version of reality to all – from Leningrad to Vladivostok, or from Munich to Kiel. Research has indicated that the dialect variation in several European countries was reduced during the twentieth century thanks to national radio and television, where a few nationally acknowledged variants were dominant.

After a generation of single-channel television, satellite TV was introduced in remote Norway in 1983. To begin with, dedicated satellite channels such as Sky and Super were dominant, and the field was still so scantily populated that certain of Sky's video jockeys were able to achieve megastar status in some European countries, since a large percentage of the target group followed them. (Anyone remember Pat Sharp?) There were only a few alternatives. Eventually, TV viewers got access to new Norwegian channels (around five or six at the latest count), in addition to a growing selection of satellite channels. Not everyone has access to everything, and many of the channels operate on the basis of subscriptions. Nonetheless, media research shows that the old national monopoly, the Norwegian poor cousin of the BBC, has lost its grip on the population. The good old days when the majority of the population gathered around the screen when the evening news was on, are gone never to return. In other words: television (and radio) functioned in an immensely integrating manner, creating a shared field of discourse on a national level, so long as it was dominated by one or a few, often state-controlled channels. Then we got a little more of the same technology (more channels, and some more, and some more still), and suddenly television no longer creates integration, but fragmentation.

We have still only seen the beginning. Digital TV, which at the time of writing has graduated from the grapevine to the pipeline, entails that each household can in principle develop its own, unique pattern of viewing. I can watch jazz concerts and poetry recitals until I fall over, while my neighbour can concentrate his attention on classical Westerns, only interrupted by weather reports presented by young and beautiful women.

It is easy to find examples from cultural history to indicate that the introduction of new technology has led to consequences other than those anticipated. I have already suggested that some of the technologies of speed, intended to boost efficiency, may have grave side-effects – and that it cannot even be taken for granted that they do boost efficiency. This is going to be a major theme later, and I shall leave it for now. But take eyeglasses, for example. Although their exact origin is unknown, the first known reference to optical lenses is from Roger Bacon, writing in 1268. Spectacles made it possible for learned persons, monks and others, to continue reading for many

years after their eyesight had begun to deteriorate. For several centuries, only convex glasses, to aid farsightedness (hyperopia), existed. This is the common form of eyesight deterioration among people above 40. The importance of this modest invention for the Renaissance and the beginning of the modern era should not be underestimated. The cumulative growth in knowledge was boosted enormously when members of the learned community of Europe could continue to expand their fields of learning throughout their lives.

Far-fetched example? Perhaps, but there are also excellent examples of wide-ranging unintended consequences of technological change to be found in mainstream cultural history. The clock, as noted earlier, was originally constructed to synchronise prayer times for monks working the fields during the day; today, it is a pillar of the modern way of life, and has become indispensable for industrial production, mass communication and large chunks of people's everyday life everywhere. When movable type was invented by Gutenberg, scarcely anyone thought that it would be decisive in the development of democracy and nationalism. And neither Gottlieb Daimler nor Henry Ford would have expected the car to lead to inner-city decay since it moved residential areas to the suburbs and shops to consumption reservations near major highways. On a minor note, it might be added that nobody would have thought, when commercial air traffic was introduced in a small way in the 1930s – as a luxurious treat for the wealthy and powerful – that intercontinental flights would be a backbone in the migration process from poor to rich countries.

New technology cannot be used for anything at all, but it is also never known how it will be used. Technological changes, no matter how dazzling, are always put to use by particular societies with particular needs. They also bring subtle, but often highly consequential side-effects with them. Writing, as mentioned in the previous chapter, impairs the faculty of memory.

Who would have believed, in the mid-1990s, that the most active users of mobile phones would be adolescents, and that they largely use them to send SMS messages in order to stay in touch with their friends hour by hour? (At the latest count, 9 billion SMS messages are sent annually in the world, a billion of them in Germany alone.) When personal computers were first marketed around 1980, reasonably well-informed journalists wrote in a deeply serious mode how they would be used to make shopping lists and inventories of the contents of the freezer. The new information technology that lurks in the background of this entire book, is still at a trial stage, and there is no way of knowing how it will be put to use in three, five or 20 years. It is nonetheless easy to see *some* consequences of information technology: it removes distance, shortens time and fills the gaps with cascades of information. Like the car and the jet plane, new information technology leads to acceleration and demands for further information, until time – seen as duration – approaches zero. But as complexity increases, so do the side-effects. Roads, for instance, have a curious tendency to be filled by cars, no matter how many lanes they have at their disposal. And a given computer network may function well for 1,000 users who run e-mail software and Netscape/Explorer, but badly for 10,000 users who are up to the same thing; just as it would function badly if the 1,000 users demanded transmissions of high-resolution video film in real time. Just as traffic jams occur worldwide in the rush hour, annoying delays and jams occur on the Net.

The proposed solutions are the same in both cases: we require more capacity and higher speed, as if that would solve anything in the long run. But let us not forget how happy we were when we finally got hard disks with a storage capacity of all of 20 Mb; at that time, we then had no idea that those devices would be ripe for the museum in less than four years.

The contagious nature of speed, and its intimate relationship to efficiency as a value in itself, is brought out clearly in a well-known story which exists in many versions. In the variant told by Heinrich Böll, a German tourist visits Spain and discovers, to his horror, a Spaniard dozing in the shade of a tree on the beach. The German approaches the man, a fisherman, and lectures him on the virtues of efficiency: 'If you had gone out fishing now instead of wasting your time, he explains, you might have caught three times as much fish and bought yourself a better boat.' Eventually, he fantasises, the Spaniard might employ others and build a factory. He could become a rich man! 'What for?', asks the Spaniard. 'Well', says the German, 'you could have gone into early retirement, living off the profits and spent your days dozing on the beach.' 'That', says the Spaniard before turning over, 'is exactly what I am doing.'

Something has run out of control. Time-saving technology has made time more scarce than ever. The wealth of available information has not made most of us more enlightened, but less enlightened. In the next chapter, I shall explain how this can be, and approach the question of what this 'something' is that seems to be out of control.

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