

On the margins: the invisibility of communications in geography

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Abstract: Though a few geographers have made communication the object of study, communication has been undertheorized by Anglo-American geographers. When considered, communication has often been conflated with transportation, or been subject to quantification at the expense of sustained analysis of its implications for people and places. The increasingly central sociospatial concerns raised by new digital information technologies, however, suggest the urgency for the discipline to re-evaluate a reluctance to engage with communication processes that, until lately, because of their relative invisibility, may have seemed naturalized or beyond the disciplinary purview. Ironically, new communication technologies, because of the visual representations in which they trade, allow social and human geography to incorporate study of communication without abandoning an empirical focus on the visible.

Key words: communication, communication technologies, digital and visual representation.

Communications seem to be the Cinderella of geographers. They are always accorded lip-service in theoretical discussion and their importance invariably acknowledged in regional descriptions. But few geographers have set themselves the task of examining communications for their own sake (Appleton, 1962: 5).

I Introduction

As a field of geographic inquiry, communications and its technologies have been the subject of fitful attention on the part of human geography. A handful of practitioners have sustained an interest in a subject that is central to understanding how people make sense of each other and the world around them. Since at least the late 1960s, with few exceptions, the issue of communications has been underpursued, underexamined and undertheorized by geographers. Focusing on Anglo-American contributions and other English-language literature, I provide a critical history of what geography has and has not done in looking at communications and its associated technologies. I discuss current research and consider why embedded assumptions about technology, the nature of information and what it is to communicate constrain the scope of newer work. As part of

inquiring after why geography privileges transportation over communications, I look at the role of telegraphy in disarticulating communications from transportation. Telegraphy is, arguably, the first technology to permit symbols and messages to move faster than physical objects. For a discipline firmly rooted in an empirical and visually dependent understanding of the facts, too often, if it can't be seen 'it's not geography'. More than a generation ago, Lowenthal (1961: 241, emphasis added) wrote that the geography of the world depends for its unity in part on 'human logic and *optics*'. Cosgrove (1984) argues that the significance of landscape as a key term in defining areal relations indicates geography's comfort with a visual bias or 'focus'. Geography is the argument of the eye (Cosgrove, 1984: 31). The relative invisibility of signals being transmitted and the concomitant naturalization of communications – including information technology (IT) – are a key factor in assessing geography's avoidance of communications. Finally, with reference to the debate between 'technological determinism' and 'social constructionism', I look at how the reduction of technology to 'gadget' or 'tool' negates considering it as an activity (see Lyon, 1994) constituted in sets of social practices. I note that humanists and social constructionists may forget that technologies are also arrangements of practices, human and machine bodies included. Such arrangements issue from, operate within and influence historical processes that are fluid, polyvalent and often barely stable. Humans set technology in motion, but it too, in fulfilling expectations, also has the potential to introduce unforeseen changes to social relations and practices.

While there are exceptions (Gottmann, 1977; Hepworth, 1987; Miles and Matthews, 1992; Robins and Gillespie, 1992; Adams, 1993; Graham and Marvin, 1996), geographers often narrowly construe communication technologies as 'space conquering' economic tools. This assumption implicitly accords primacy both to the metaphor of communications media as neutral 'conduits' or 'channels' between the outside world and the subject and also to a space = distance equation.¹ The implicit positioning of communications and its technologies by geographers as passive, value-neutral 'conduits' or 'tools' participates in an unproblematized use of metaphor that minimizes consideration of the social contexts within which new technologies originate. Therefore, in the discussion that follows, I pay particular attention to geographers who consider how the social affect that attends technological implementation is constituted.

II The invisibility of communications geography

A generation ago, Abler (1974: 330) commented: '[t]here exists a considerable geographical literature on the analysis and design of transportation networks, but there is no comparable literature on communications networks.' Earlier still, Appleton (1962) had noted geography's difficulty in studying a phenomenon undergoing rapid change. He identified the ever-accelerating rate of technological innovation as just such a phenomenon, speculating that geographical analysis of communications possibly was being avoided as it was '*like trying to paint a model who won't sit still*' (Appleton, 1962: 229, emphasis added). Though transportation and communications both may be thought of as tools society employs, a transportation focus, and the more visible hardware this implies, suggests the preference of many geographers to work with empirically verifiable facts fully constituted in a material reality, and to downplay the interplay between these concrete facts and the productive realm of 'culture' or 'ideas'. For purposes of analysis, human geography has often ignored how these facts relate to the interpenetrating

spheres of social relations and meaning – both of which are central to the study of communications.

The telegraph is useful in pointing towards a productive explanation for geography's coolness towards communications only implicit in Appleton's apt metaphor of the model who won't sit still. Dominated by Western Union, the first large industrial monopoly, the telegraph had achieved widespread influence by the mid-1800s. The *activity* performed by the telegraph – the transmission of information separated from an embodied messenger – though apparent to all users, was and remains *invisible*.

In 1981, Bakis noted the scarce geographical reference to telecommunications, relating this to the invisibility of telecommunications in urban and other landscapes. Invisibility seems key to grasping geography's relative disinterest in communications. Not only has communications geography been hobbled by a narrow transportation-orientated focus on distributive function but also, as Kellerman (1993: 12) notes, geography deals with tangible artifacts, and information flows *cannot be seen*.² Data resist the visualization expected by a social science discipline that is focused on what can be seen. The terminals constituting the nodes of information networks occupy little space. 'Paradoxically, however, the barely visible geography of telecommunications may well be the most extensive geography' (Kellerman, 1993: 12). Mitchell (1996) extends Kellerman's observations when he asserts that the deployment of fibre-optical wiring necessary for a 'global' digital telecommunications network is as significant today as the introduction of Haussman's boulevards was for nineteenth-century Paris. Fibre-optics reconfigure 'space and time relationships in ways that [promise] to change our lives forever. Yet their revolutionary intervention [is] swift, silent, and (to most eyes) invisible' (Mitchell, 1996: 3). Bakis (1993: 7), perhaps, typifies geography's approach to communications when, in arguing that the geography of telecommunications is a 'generalist theme', he acknowledges that information can be an 'immaterial flow', but then suggests that geographers instead study the physical infrastructure that supports it.

Writing about the relationship between telecoms, world cities and globalization, Moss (1987: 535) notes that '[t]he telecommunications infrastructure – which includes the wires, ducts and channels that carry voice, data, and video signals – remains a mystery in most cities ... underground cables and rooftop microwave transmitters – are not visible to the public'.

A visually orientated geography defines its interests empirically as that which can be seen. These interests often have been defined by the discipline as transportation effects that are studied, described and scientifically 'photographed' as snapshots of 'reality'. An anthology such as *Silicon landscapes* (Hall and Markusen, 1985), for example, charts the history, development, innovation and economic prospects of the computer industry. It all but ignores, however, what computers might mean to the geographies under review; or why, as discursive technologies, computers arise at the spatiotemporal moment they do; or what affect they might achieve, if retheorized other than as mere tools in reformulating areal differentiation. A partial exception to this overly empiricist approach is Hägerstrand's (1986) later interest in the capacity of radio and TV to open a 'possibility space'. Such a space, Hägerstrand argues, may enhance social communication and potentially abet democratizing decision-making. Forer's (1978: 232) comment retains saliency to the degree that practitioners focused on spatial pattern preclude concern with process. Increasingly, however, geographers are synthesizing facts into the broader matrix of social relations. This is a necessary move for the discipline. At a time of increasing technical occlusion of the natural world, traditional empirical approaches

seem inadequate to the extent that they do not address the ambiguity of what constitutes 'fact'. Searle (1995: 1) makes a useful distinction in this regard between 'institutional facts' – 'facts in the world, that are only facts by human agreement' – and 'brute facts' such as the existence of snow or Mt Everest, which are independent of human opinion. In the case of the social negotiation that precedes establishing an institutional fact, process has priority over product (Searle, 1995: 57). Language, Searle (1995: 9) suggests, is essentially constitutive of such institutional facts or realities. Institutional facts often seem fudged and buried under empiricism's implicit understanding that all facts are brute.

While human geography is moving beyond the visible and pure description as objects and method of study, it should also be noted that technologies such as virtual reality (VR), as a space for communications and data flow, make aspects of communications processes more visible. In a culture equating seeing with knowing, this visibility takes the form of a picture language or visual metaphor so that people might relate sensually or perceptively to what is 'transmitted' within the so-called parallel realities of 'cyberspace'. As a result, there now exists a highly visible subject for communications geography to examine. In an ironic reversal, an invisible set of codes – a set of institutional facts increasingly standing in for brute ones – has become accessible to geography's traditional visual purview, the issues of metaphor, immateriality and formlessness of data notwithstanding. Thus VR provides an excellent phenomenon that communications geography can fruitfully explore (see Hillis, 1994; forthcoming).

Coming to terms with why certain technologies garner cultural meaning contributes to a wider understanding of the contemporary position of such technologies *vis-à-vis* the lived world they participate in reorganizing. Any geographer interested in linking communications, places and social theory is faced with the task of grappling with the contradictions inherent between culture and economics, and in holding these concepts apart. Culture is a social and material practice and an idea. It incorporates social relations and the production of meaning, and hence economics can be included under social relations. However, political economy's privileging of economics tends to occlude active consideration of meaning as part of its adherents' attempts to understand and describe cultures in places. This tension between economics and culture is also fused in these technologies, representing as they do an ironic synthesis of positivist and postmodern points of view. Then too, like language itself, communication technologies increasingly are 'naturalized' and seem like a 'second nature', which, under the sign of humanism, has little potential for activity, and hence little ability to attract the analyst's eye. This naturalization interdepends directly with the neutralizing tendency to position communication technologies linguistically as media conduits. Were a geography of communications also to have treated communications as a system or network of technologies, this would demand consideration of *both* the social relations informing the technical determinations behind the designs *and* the character or form of the technicized affect set in motion as part of a restructuring of the social world as an object of control (Gigliotti, 1993: 8).

Marvin's (1988: 190) observation that new technologies 'intended ... to ... enhance the conduct of familiar social routines may so reorganize them that they become new events' has clear spatial implications. Her observation dovetails with Veregin's (1995: 91) point that technology achieves its greatest affect after a disappearing act – when it becomes so commonplace that it is accepted as an indispensable 'second nature'. This disappearance or 'forgetting about' is also the naturalization of the technology-as-conduit metaphor, though on a day-to-day basis, any material or cultural technology must recede into the

'background' of a place if it is to have any meaningful affect. Even geographers looking at communications implicitly accept the indispensability and hence unquestionable status of the technology that drives the media they study – an acceptance that helps technology's social and material affect to *disappear from view* and thereby also to be of minimal importance to 'the geographical imagination' as currently envisioned.

III Telegraphing the message: the disruption between transportation and communications

I noted above the invisibility of the telegraph's signal. The telegraph's introduction permitted messages to travel faster than the physical transportation vehicles – horses, runners, stagecoaches, trains – once necessary for all message transmittal between people in discrete places. Before telegraphy, such communication operated within social contexts wherein communication and transportation were not yet disarticulated. Consider the apocryphal curse 'damn the messenger'. Implicitly pretelegraphy, such an utterance implies the consubstantiality of the individual carrying the message and the message itself. Stated otherwise, it reflects a period when transportation and communication are one. We may slam down the phone in disgust, but we not longer execute the instruments – the reluctant and winged 'mercurys' of old. Most communications geography, however, still looks at transportation vehicles and not at how communications may operate as a technologized language practice. I am, here, also asserting that a communication mechanism's form affects how meaningful content of messages is received.

In discussing the importance of telegraphy in reconstituting nineteenth-century decision-making across a range of physical and social geographies, Carey (1983) notes that print technology cannot disseminate itself. Yet its speed of distribution was adequate for the territorial size of emerging European nation-states (see Anderson, 1991). The vast physical scale of the American state demanded greater instantaneity. The telegraph, introduced in 1844, initiated the separation between transportation and communications, as the information content of the technology, unlike print, not only could move from one place to another with minimal human intervention but also faster than physical objects. As a communications device, the telegraph exemplifies the coming of symbols to control physical processes (Carey, 1983: 304–305).

Because of the telegraph's speed, people came to equate communication with the transmission of messages across space. 'The telegraph ... allowed symbols to move independently of ... transportation ... [and] freed communication from the constraints of geography' (Carey, 1983: 305). Abler's ability to identify a 'collapse' of (absolute) space due to 'space-adjusting technologies' or 'time-space convergence' is only possibly subsequent to the telegraph's diffusion. The telegraph allowed electrically communicated messages to be understood as operating differently from the transportation of people and material goods through space. More important, the telegraph allowed communication to *control* transportation – for example, the construction of telegraph lines parallel to rail lines allowed the co-ordinated scheduling of trains. Communication of messages superseded their transportation by humans, animals or vehicles (see also Blondheim, 1994).

At the same time, linked by electrified communication technologies, actual places became less conceptually separate as inhabitants progressively self-identified as consumers of information who perceived their interests to extend across an ever-widening geographic range (Brooker-Gross, 1985). With almost every place having

reliable access to more information, an earlier 'city-state capitalism' gradually yielded to an emerging national commercial middle class linked to the telegraph and its 'economy of the signal'.³ This permitted the establishment of, for example, the futures market at the Chicago Board of Trade⁴ (Cronon, 1991: 122, 332), which played a vanguard role in shifting speculative activity away from space and towards time (Carey, 1983: 316). Cronon (1991) also finds that the telegraph's spread across the USA led to an amalgamation of earlier discrete regional economies. A newly emergent market geography was independent of local climate or soil fertility. It relied instead on price and a flow of information throughout the entirety of its wired economic sphere (Cronon, 1991: 121).

The process has been ongoing. Gould (1991: 4–5) argues that because of telecommunications, though the study of place remains important in geography, it is only so in relation to other places. Arguing that human geography's chief concern is with how connections between people and places are made, Gould suggests that communications' 'structuring' of space influences how things move through it. The kinds of things that attract Gould's interest are a synthesis of messages reliant on communication technology and other concrete items. These include 'letters, telex messages, telephone conversations, flows of money, raw materials, information, diseases, films, television programs, manufactured goods, ideas ...' (Gould, 1991: 4). Insisting upon the continuing, albeit diminished, importance of place, Gould asserts there can be no geography without communications. However, within a disciplinary practice like geography that privileges empirical observation, one might be led to believe that subsequent description of the 'restructured' spatial array of data sets promoted by communication technologies constituted a sufficient end of study in itself. While such description is a necessary step, any geography of communications also needs to rest on the 'ground truth' that there can be no geography without a body, a place or a socially embedded yet contingent stance from which the message is first uttered and received.

Carey (1975: 10) defines communications as 'a symbolic process whereby reality is produced, maintained, repaired and transformed'. He notes the dual capacity of symbolic forms: '[A]s "symbols of" they represent reality; as "symbols for" they create the very reality they present' (Carey, 1975: 16). A blueprint of a house guides construction of the real house. It also may be used to stand in *for* the real thing, in the same way as when models are used to explain the natural world. I would add that geographers attempting to explain and understand communications and information technologies, which suggest a merger of 'symbols of' and 'symbols for', may inadvertently advance this merger. As exemplified by the rapid acceptance and diffusion of telegraphy, the social centrality of communication technologies accords such symbolic devices and practices a highly privileged status that in turn contributes towards their rapid cultural naturalization and acceptance by people even before they are explained. This process is applicable to social scientists too. When something becomes both an essential 'social' technology, yet also a device, a critique of it becomes easier to position by the dominant discourse as marginal, eccentric or Luddite. Yet it is also possible that this positioning may be as 'naturalized' as the technology in question.

IV (Almost) a communications geography, c. 1974

During the late 1960s, almost as if to answer Appleton's lament noted in the epigraph above, an incipient (American) communications geography seemed posed to shed its

'poor step-sister status' and arrive, in Cinderella-like fashion, 'at the ball' properly shod. Its epistemological underpinnings and approach are captured in Warntz's (1967) nostrum 'the tyranny of space', wherein, implicitly, geographers are positioned not unlike physicians in their tactical approach to space as a disease for which communication technology will be one part of the vaccine. For Warntz, space is a masculine tyrant and distances polices 'his rule'. As social physicists, geographers are 'disloyal' subjects at the vanguard of a calculated, technology-driven revolt against space's power (Warntz, 1967: 11). This revolt is intended, it is hoped, to shrink inequities between haves and have nots through the application of systems theories to the social sphere (Warntz, 1975: 78–79).

Riding a wave of Toffleresque enthusiasm for forecasting and mega-projects designed to usher in peace on earth, much research from this era uncritically promotes a glorious future of communication networks bringing people together in a post-urban world. Despite the utopic tone of this period's writing, a few geographers raised questions about the coming shift from material commodities to information (Abler, 1974); global deployment of telephony (Abler, 1975a); advancing large-scale computerization (Janelle, 1975); and the social significance of information (Abler *et al.*, 1975; McDaniel, 1975; Gottmann, 1977).

Yet Janelle's (1968) *time-space convergence* – a means of accounting for velocity of travel between discrete places – and Abler's (1971; 1975a) subsequent notions of *time-space convergence* and *divergence* – measurements of rates at which places move closer together or farther away from each other in travel and communications time due to space-adjusting technologies – today seem at the service of explaining, even facilitating, the progressive emergence of a technically more proficient and futurist new world order. Abler *et al.* (1975: 11), though following on Warntz's space-as-tyrant metaphor, noted, however, that 'by freeing ourselves from the tyranny of space we assume in its place the tyranny of communications'. J. Adams (1972) had also looked to the consequences of 'earth shrinking' developments in transportation and communication. Though Adams focuses on the disbenefits of global transportation technologies, he also points to a general forgetting on the part of social science contemporaries about who owns and who benefits from the extension of new technologies. He also warns against the centralizing mechanisms of control embedded in new transportation and communication technologies that shrink distance.

Moss (1987) divides this earlier stage of communications geography into two schools of thought. Abler's work is characteristic of the 'first school', and his comments eagerly anticipate the immanent obsolescence of central cities, whose importance is ceded to communications networks:

... if communications systems provide complete time- and cost-space convergence, why have cities at all? If everyplace is everyplace, and if a person is as centrally located in Thief River Falls as he is in Manhattan, why have a Manhattan? ... if the delights of Manhattan can be brought to Thief River Falls electronically via three-dimensional, life-size holographic imagery, why make the trip? Innovations in interpersonal communications could bring us to the point of asking ... where reality begins and where it ends (Abler, 1974: 51).

Abler linked future advances in information transmission to the dispersal of decision-making and information gathering functions away from primary urban centres. He forecast an eventual global equality of information availability that would minimize locational advantages for administrative activities in downtown cores (Abler, 1970: 15). Abler's work from this period exemplifies the interest in scientific application of networks. Though it assumes a liberatory potential for technology, efficiency is

sovereign, and outside highly abstract Utopian predictions, the interplay between communication technology and social relations receives scant attention. Asking 'Why have a Manhattan?' implies the fabled isle is dispensable. Yet in the next thought the author discusses its delights. Implicitly, even for Abler, Manhattan exists, in part, for its unique 'delights'; his own example disproves his implicit assertion that communications can render every place the same.

Gottmann (1977; 1983) exemplifies the second 'school' of communications geography, which acknowledges the primacy of communication technologies such as the telephone while at the same time linking telecommunication effects to the configuration of cities. Gottmann (1977: 303) also commented on the absence of scholarly analysis of the relationship between communication technologies and ways of life. In the same essay, he suggested that the telephone expresses a cultural wish for spatial *fungibility* – a kind of metaphysical desire for one place to be freely interchangeable or replaceable by any other. This is the same desire, I would note, that would seem to have propelled Abler's reduction of Manhattan to life-sized holographic imagery. Gottmann is interested in how telecommunications influence the function of urban centres. He argues that telecommunications allows spatial segregation within, for example, the same firm or organization, as well as between urban areas (see Pred, 1975; 1977), while at the same time it encourages the spatial aggregation of functions intraorganizationally or within the same city. Gottmann positions communication technology as a mediating tool within the social arena, though his 1977 article also contains hints of an awareness of the synthesis between medium and technology. Gold (1991: 327) notes that 1970s' communications geography's assumption of a direct and unproblematized 'impact' of technology on society ignored subtleties of people's response to the technologies in question, and failed to assess the role of increasing rates of change on social relations. Gold's findings point to the implicit technological determinism that provided the ideological fuel to the futurism that informed much writing from this period.

At times, however, observations achieve greater nuance. Ward (1971: 100) notes the telephone's reduction of locational constraints facing businesses that depend on responding rapidly to variable demands – though his focus is how transportation innovations contribute to changing urban form and social makeup. His transportation emphasis bears out Moss's (1987: 534) observation that 'despite the contribution of communications to urban growth, far more attention has been given to transportation systems than to communications systems in the study of cities'. In particular, the work of Meier (1962) and Webber (1963; 1964; 1970) demonstrates these authors' greater awareness of the interplay between communication technologies and social relations than many of their contemporaries. Meier focuses on communication and communication technologies that allow ever faster transmission of messages across ever larger spaces. For Meier, such transmissions are pivotal activity patterns that help explain the emergence, growth and dominance of urban social organization. With reference to the Watts 'riots' in 1967, Webber (1970: 15) connects an increasing reliance on communication technologies to an increasing awareness of social injustice and racial inequality on the part of African Americans. Though Webber 'was a pioneer in recognizing the significance of communications in extending the boundaries of social communities' (Moss, 1987: 535), he, too, uncritically embraces the technological futurism and scientism espoused by Toffler, Fuller and Doxiadis. Though he subtly observes that, as factors organizing 1960s' urban life, geography and territory are ceding ground to cosmopolitan attitudes driven by communication technologies, his exuberant use of metaphor reduces the city to

'essentially a massive communications switchboard through which interaction takes place' (Webber, 1970: 6).

In retrospect, the much-heralded collapse of space by 'disloyal' geographers keen to 'overthrow its tyranny' – in concert with the progressive application of electronic communication technologies to previously less mediated spheres of human experience – has led to the kind of technological space identified by Virilio (1986). Instead of being geographical, technological 'space' is a quasi-metaphoric 'space of time' that none the less moves at the speed of light. Communications geography from this period also assumes the salience of theorizations such as McLuhan's (1964) vision of a global culture linked via a communications system doing double duty as the extended and externalized nervous system of 'man'.⁵ Mattelart (1994) offers very plausible argumentation that it was precisely during this period when 'communications' and 'the communications revolution' superseded the concept of 'progress' as a dominant means of conceptualizing the extensibility of the west. I would link this argument to Simpson's observation (1995) that *technological* progress retains an undiminished lustre across a spectrum of otherwise adversarial philosophies, theories and academic practitioners.

V Communications geography as a field of inquiry

[L]ittle research has been pursued along conceptual or theoretical lines. Work on communications and its technologies by ... human and cultural geographers is exceedingly rare (Kellerman, 1993: xvi).

During the period following the mid-1970s – and the phenomenological, Marxist and behaviourist critiques of spatial analysis and the tilt towards forecasting a Utopian future freed from considerations raised by social relations – geography's *explicit* interest in communications receded and was maintained by a lonely few (see, for example, Bakis, 1981; Kellerman's (1984) contribution to this journal; Abler and Falk, 1985; Burgess and Gold's (1985) related efforts to introduce human geography to an emerging cultural studies approach to media; Falk and Abler, 1980; 1985).

Kellerman (1984: 223) noted the paucity of geographical empirical work in telecommunications; however, the late 1980s heralded an increase in publications addressing the nexus of space, telematics and social change. The focus is less organized around relationships among telecommunications, cities and theories of corporate decision-making, and three broad, inter-related themes, often blended in individual works, can be identified. There is an interest in how communications participate in the remaking of places; communication technologies are assumed to be more or less neutral conduits through which messages flowing from senders to receivers pass in a more or less unchanged manner; and Innovation/Diffusion is looked at for its applicability to understanding the role of communications under contemporary global late capitalism. The late 1980s resurgence is also limited in scope to the degree that issues of 'culture' are eschewed in the strong focus on political economy. Empirical and often Marxian analyses treat information as an economic fact (see Hall and Preston, 1988; Knox and Agnew, 1989; Storper and Walker, 1989; Bakis, 1993). Within this period, new ITs frequently get lumped together with older forms of information and communication technologies as part of an overall 'information economy' (Miles and Matthews, 1992: 96). The positioning of communications by geographers as an adjunct to an 'economics' without 'culture' deflects attention from how these technologies participate in reworking conceptions of space.

1 Communication/place

Geographers *have* commented on how different or new forms of communication might influence perception and the ways we make and remake places. Philbrick (1975: 23) observes that the ocean once restricted movement, but long-range sea-worthy vessels turned it into a highway or connector. New technology alters existing relationships between humans and environments, and the technology then becomes part of the environment influencing subsequent human actions. Forer (1978) notes the shrinkage of space. He links this to new transportation and communication technologies and suggests they promote an increasing plasticity to how space is understood. Lamberton and Mandeville (1982: 162) theorize the 'substitution of communication for transportation', noting that electronic technologies make industry and people more 'footloose' by emphasizing movement of information over physical movement of goods. Echoing Gottmann, and witnessing the emergence of so-called edge cities, they posit a series of weak nodes – multcentred cities with the central business district (CBD) just one more focal point linked with all others via an electronic net (Lamberton and Mandeville, 1982: 164). Kutay (1986) makes a similar argument, finding that computer-mediated communications continue to weaken downtowns and diffuse the location of economic activities formerly associated with the CBD. Mandeville (1983) extends this argument, acknowledging the emerging relationships among telecommunications, homework and global multinationals. He also points to the discrepancies between the anticipation and official hype attending new ITs, and the eventual contexts within which they operate and the outcomes to which they contribute (Mandeville, 1983: 68).

These examples comment on the culturally inflected, material relationships among idea, perceptual change, technological change and changes 'on the ground'. More often, however, human geography has not pursued the promising avenues of inquiry suggested, for example, by Gottmann's emphasis on fungibility, and instead has avoided explicit discussion of the links between technology and social relations. Exceptions to this general rule again include Abler (1975a: 148), who notes that the introduction of Rural Federal Delivery by the USA postal service killed crossroads settlements, local post offices, general stores and the particular social qualities of these places. Cronon (1991: 330–40) discusses the importance of department store Montgomery Ward's introduction of mail-order catalogue sales to a credit-starved mid-West hinterland. He also describes the pivotal role of the telegraph in facilitating grain futures trading at the Chicago Board of Trade as early as 1853 (Cronon, 1991: 124, 332). In Brunn and Leinbach's anthology organized around geographic aspects of communication and information, Janelle (1991: 58) notes that 'space adjusting' telecommunication technologies often facilitate greater ease in connecting with someone 2000 miles distant than with a person across the street. Howenstine (1991: 293–97) traces parallels between the growth of primate Latin American cities and media images of cosmopolitanism which lure rural emigrants, while Lyew-Ayee (1991: 386–87) notes that Jamaica's back-office information processing jobs have resulted in closer and cheaper communications ties with the USA than with nearby Caribbean states. Bluestone's (1991) account of the late nineteenth-century role played by Chicago's downtown Loop offers a superb overview of the (politicized) reorganization of space partially brought about by telephony. Bluestone notes that telephone links between grim factories on the city's periphery and glittering downtown front offices were pivotal in deflecting critique of often deplorable shopfloor labour practices.

2 Diffusing conduits

An unacknowledged assumption of a conduit metaphor suffuses much of the work of the already-noted resurgence of interest in communications by geographers, starting in the late 1980s. The conduit seems implicit whether geographers are looking for patterns between points in Euclidean space, or for ways to argue connections and processes operating between or among places understood *in toto* as constituting overall fields – what Warntz (1975) had referred to as the ‘pattern of patterns’. Communications understood as a conduit or pathway accords well with a broad disciplinary focus on identifying and mapping patterns. This metaphor also allows geographers to position communications within larger contexts, and much of the work is organized around what I will term a renovation of 1960s’ Innovation/Diffusion. A naïve empiricism often subtends the overlooking of causality and the material aspects of media in this work. Meyrowitz (1993: 56) notes three dominant metaphors deployed for understanding media, and therefore their potential to act as conduits, languages and environments. Media theorized as conduits and environments assumes that users remain distinct from these ‘channels’ or settings (Meyrowitz, 1993: 61). I would note that the word *media* itself, when referencing print, broadcast and newer ITs, deflects attention from these *technologies’* interpretive and transformative roles in favour of a more restrictive understanding of technologies as conduits transmitting ‘information’ without altering it in any way. Geographers often treat communication technologies in the same way as they do pipelines made of concrete or steel. Critiquing the assumptions of naïve empiricism and the ‘brand’ of philosophical realism under which ‘what you see is what you get’, Mark Poster (1990: 95) notes that such approaches position databases as ‘a tool, a technological fix, that perfectly reproduces printed information. This view ignores the productive role of languages in shaping meaning and practice’. This implicit restriction on theorizing languages’ relationship between their forms and their agency also inhibits considering ways communication technologies – which both transmit representations/language, and which rely on language and code and the implicit or explicit ideological assumptions of engineers and software designers – help shape geographic meanings and practices across a variety of scales.

Diffusion is the rate of acceptance for innovations, new ideas, technologies and modes of social organization by intended users. Geographers interested in diffusion have often positioned inventions at the beginning of the diffusion process (Clark, 1984). Yet this contention collapses the invention with its diffusion. As a result, diffusion is seen as beginning when the invention is available for use. Privileging inventions over human intention diverts attention from social processes informing the invention or ‘event’ that is a culmination of these difficult-to-model processes, though, inadvertently at least, it may redirect some attention to the role of science in social policy. Extending Livingstone’s (1992: 328–29) critique of quantitative and positivist approaches within the discipline, I would note that an implicit utilitarianism present in Innovation/Diffusion, with its emphasis on the routing by which manufactured innovations diffuse (see Hägerstrand, 1967), has the effect of restricting the meaning of communication to a function of distribution. This distributive bias is evident in Abler’s (1974: 327) emphasis on the mapping of ‘the pathways’ by which information is communicated. Distribution requires the means to distribute, and I refer back to communications geography’s comfort in understanding communication technologies as conduits (or ‘pathways’, ‘paths’ or even the ‘life paths’ postulated by Hägerstrand’s (1970) Time-Geography updating of Innovation/Diffusion). In Livingstone’s (1992: 328) words, such approaches ‘evacuate

language of value judgement and . . . replace it with a formal calculus'. Such a calculus is a 'consequentialist' end that concords well with the positivist assumptions morally infusing these approaches (Curry, 1995: 74). These assumptions lead to the substitution of calculation for evaluation (Livingstone, 1992: 329) and the modelling of static *events* into patterns that often occlude consideration of the 'messy' and 'fluid' human *processes*, most of which resist the hard boundedness, delineation, pattern and sharp categorization of which the social sciences are too often enamoured.

If a naïve empiricism allows geographers to theorize communication and communication technologies largely as value-neutral mediating tools, we are again returned to the naturalizing conduit metaphor that directs geography away from looking at communications as technology. Heim (1993: 77) distinguishes between interactive communications and tools: 'A human user connects with the system, and the computer becomes interactive. Tools, by contrast, establish no such connection.' Tools do not adjust to our purposes, except in the most primitive sense. Markley (1996: 6) makes the related argument that a dualistic metaphysics divorces mind from body and thereby fosters a view of technology as only an insensate object or tool that humans manipulate, rather than a process 'that disrupts and reconfigures whatever we take to be "essentially" human'. Miles and Matthews (1992: 96) note that new ITs based on digital telematics are distinct in their ability to handle data in many different ways, and in their ability to perform tasks, as well as to store and transmit information on how they have performed.

Hall and Preston's (1988) work on ITs updates Innovation/Diffusion, and they acknowledge that innovation is influenced by society, which decides which technologies get adopted (see also Clark, 1984: 22). Social and political innovation must follow if the technology is to be used, and diffusion to occur (Hall and Preston, 1988: 266). In order to expand telephony's pre second world war role as an instrument of production, people had to gain comfort using phones for personal communication. When familiarity was achieved through promoting personal consumption of telephone services during the 1950s, as well as through necessary infrastructural enhancements (Hall and Preston, 1988: 273), a society of telephone consumption could come into being.

Falk and Abler (1985: 21) and Abler (1991: 36) complicate understanding IT and telematics in terms of Innovation/Diffusion by noting that telecom industries and services evolve in spurts, have never diffused, but instead have been rationally organized across territories by monopolistic firms or state agencies. Abler (1991: 37) identifies a 'utility penetration paradox': a 'spine' must be in place before use is possible. He argues that when telecommunications extend messages instantly to every place, diffusion becomes a superfluous concept because time has been set aside.

For Hall and Preston (1988), 'convergent ITs' – a concept that may be taken to address Abler's concerns about time – require all equipment to inter-relate. The co-operation required between those erecting such a network and users will 'have as profound an effect on the structure and location of production as railways, motorways and jet aeroplanes did in their eras' (1988: 274). The authors' acknowledgement of social and political innovations helps operationalize the humanist critique that diffusion cannot be modelled without including the context within which decisions are adopted. Nevertheless, Hepworth (1989) critiques Hall and Preston's focus on information, arguing that it deflects consideration from the social relations that drive both production of ITs and late capitalist economics.

Paul Adams' (1993) description of the theatrical territoriality employed by students occupying Tiananmen Square in Beijing suggests that the ability to touch the cultural imagination of distant viewers is as important as speed and instant connectivity. He theorizes 'cultural vaulting' achieved through television's ability to rally empathy for distant strangers under duress. More recently (1995), he has worked to update Time-Geography in order to incorporate consideration of how human judgement operates within a set of communicatory pathways, the boundaries of which, within limits, can be altered by human agency. Though he assumes a conduit approach, Adams' work remains a rarity. Too often, human geography is indifferent to the importance of the ways in which *people* use communication technologies as part of the social arrangements that also incorporate themselves and their contextualized activities. So, too, is human geography often indifferent to the possibility that communication does not exist for its own (deterministic or teleological or scientific) ends, or, conversely, that communications is only an adjunct to social relations and theories of the firm, location analysis or reification of state and corporate hegemonic practices. Either communications is subsumed and made to operate within an inherently metaphysical and disembodied matrix of economic progress, or it is the adjunct of social relations. It is rarely perceived as 'the language' that links both.

3 Moving beyond diffusion in thinking about communications

In general, geographical approaches to communications confirm geography's tradition of favouring patterns over people. Cities and places are settings or instruments to be observed and rarely are treated as exerting any agency or force. Electronic telecommunications, however, have the ability to unsettle people–environment relationships and self-conception – destabilizations and reformulations that affect being in the world.

Kellerman (1993: 29) writes that cellular telephony changes the idea of a telephone from something reaching people in specific places (an assumption upon which Abler's earlier work rests) to one that reaches people anywhere. His argument augments Meyrowitz's (1985) observations that telephones burst into places, sundering their bounds. Kellerman (1993: 30) notes that constant access to telecommunications destroys a sense of 'before and after'; temporal hierarchies are undone. He further suggests that telecommunications 'do not directly create decentralization, but they create the opportunity to make a decentralization decision' (1993: 111). At the same time, telecommunications recentralize, giving rise to 'dispersion-concentration' or 'convergence-divergence' (1993: 15). The power of recent optical imaging and scanning technologies (1993: 191) to automate and reduce workloads and costs is allowing, for example, firms that only recently established back-office and offshore electronic sweatshops in such places as Barbados and Jamaica to abandon them in favour of returning the remaining work to the head office (1993: 111). I would note that such a change has obvious social implications – the loss of employment, for example – yet Kellerman's emphasis remains on the changing forms of technology and not on social consequences.

Kellerman (1993: 60) also finds that 'society can be viewed as a series of nested message flows'. The position adopted by Robins and Gillespie (1992) can be used to extend and problematize Kellerman's quasi-cybernetic thesis. Though 'new technologies by no means signal the final transcendence of spatial barriers' (1992: 149), the authors assert that the real changes wrought by telematics and ITs revolve around the 'coordination of mobility and fixity' and a 'corporate globalism' expressed through 'deterritor-

ialization and reterritorialization' (1992: 156). While there is information flow, production still has to *take place* materially.

Hepworth (1989) has also had something to say about communication technologies, and what I term the increasing importance of the 'geopolitics of cyberspace'. In looking at the 'geography of the information economy', he (1989) focuses on technological innovation within communications, suggesting that centre-periphery relationships continue within IT but now extend and refine a spatial division of 'information labour'. IT defines a spatial system on its own, in its convergence of computation and telecom innovations (Hepworth, 1987: 157). Hepworth (1986) focuses narrowly on the relationships between IT and urban and regional systems, and between IT as technological change and 'the firm' – albeit to suggest ways in which these affect social relations. His critique of earlier assertions by communications geographers and of current economic geography's avoidance of IT's possible consequences is notable. He finds it 'obvious that network innovations do not "adjust" space or time in a literal sense' (1986: 175). Rather, these innovations highlight not only the different ways that meanings have been ascribed to time and space both by economics and by local communities but also the different values that undergird different definitions of information. Geographers may assert that new technology is ushering in the 'spaceless world of neoclassical economic theory' (Hepworth, 1986: 175), a placelessness under which equality of (free-market) economic opportunity would be available to all. However, such as utopic view – central to 1970s' research – is nowhere on the horizon.

Hepworth notes the plethora of issues raised by IT for geographical analysis. The fluidity of IT innovations, however, threatens geographical analysis that rests on neoclassical theory with its closed loop positioning of the firm as self-sufficient, hence amenable to modelling as a static event. Geographical research on IT and its effects has proceeded in an uneven fashion: 'A large and growing body of literature is concerned with the location of information technology production ... considerably less attention has been given to the usages of information technology ...' (Hepworth, 1986: 175–76). Hepworth has subsequently argued that networks produce a new spacial and networked 'fuzziness' between public and private geographies. Fuzziness implies electronic quasi-integration of firms, regions and places (Hepworth, 1989: 120–25). Current examples include the PLUS[™] and CIRRUS[™] financial networks accessed via ATMs. As human-network terminal interfaces, ATMs point towards the new fluid world of capital and banking and demonstrate 'the urgent need to change our "vision" of capital and its spatial behaviour' (Hepworth, 1989: 90). Addressing similar concerns, Thrift (1987: 211) links an increasingly globalized 'commercial capital', the rise of international finance centres and a parallel diffusion of particular middle-class values, to 'converging technologies of communications, computing and information gathering'.

If for Carey and Cronon the telegraph offered a means of amalgamating nineteenth-century regional economics into a single national entity, telematics and ITs now work to sunder this earlier unity even as they facilitate a variety of global entities and understandings. Far-flung nodes of production are increasingly easy to control via networked IT. Recent work has questioned the underexamined assumption of decentralization via communications as an unalloyed good. Goddard (1992: 200) finds a new dynamic of unevenness in regional development within the UK, proposing that reregulation may be necessary to prevent 'off-line' regions from becoming 'wastelands'.

Examining the dynamics of global capital suggests firms using telematics as part of implementing divide-and-conquer strategies between distant places are recentralizing

power unto themselves as corporate entities, even though any one firm's physical presence may be quite dispersed. The ITs used operate as forms of power, even if the recentralization they promote is often cloaked in an aesthetics of 'play' and 'difference' (Harvey, 1992: 3, 49). Indeed, ITs are part of late capitalism's consolidation of control over planetary economics, a fact which in no way contradicts capital's geographic dispersal and mobility (Harvey, 1988: 109).

Assessing the relationships among decentralization, internationalization and rapid changes in communication technologies, Warf (1989: 269) notes that 'the social consequences of telecommunications have received relatively little scrutiny'. Though some geographers now note the importance of communication, often in a determinist fashion that relies on the metaphor of 'impact', there is an overall lack of engagement with what this importance might mean beyond its acknowledgement. Though technological determinist approaches often are denied, communication technologies nevertheless are seen implicitly to shape social relations, which can be modified by the use of additional technologies such as geographic information systems. Echoing Hepworth's (1987) assertion that IT unsettles geographic theory, a subtext of Knox and Agnew's (1989) thesis on 'world-economy' asserts that a traditional geographic approach to the economic region is undermined by telecommunications and the concomitant rapidity of economic restructuring. The authors acknowledge the importance of networked communications to the suzerainty of the global urban hierarchy they identify. They situate themselves within the subdiscipline of political economy, arguably where acknowledgement of communications has been greatest.

In the work of these critics, however, communication is addressed in an expansive fashion. Its examination is limited to how ITs facilitate moving information-as-commodity in order to gain material advantage. Scott (1988: 27) asserts, for example, that intangibles such as information, news and advice 'are commodities, just as raw materials and manufactured outputs are'. Storper and Walker (1989) link new technologies to capitalism's ability to undertake new territorial expansion. The authors link the enhanced status of information to the more fluid forms capital now takes. Capital's new fluidity gives it an increasing ability to vault across territories as part of capitalism's search for areas where social relations are most yielding to its need for accumulation: '[I]nformation is specifically attached to activities such as mercantile trade, banking or integrated circuit design, not generally to places' (Storper and Walker, 1988: 33). True enough perhaps; however, given the accrual of power to communication technologies, it is remarkable that political economy has not seen fit to query more fully the discipline as to why generally its practitioners have been more concerned with, for example, mapping the trucking of a Cray supercomputer across the country, or the price of this computer *vis-à-vis* a basket of other commodities, than with the significance of uses to which the Cray will be put. At least political economy accords a role to IT. The new cultural geography, however, though influenced by cultural studies approaches often rooted in communications, has been more reticent to do so.

Burgess (1990: 139) argues for a geographical research agenda based on communications media that would yield fresh understandings of 'the wider discourses about relations between groups of people and their environments'. The interdisciplinary work of Morley and Robins (1995) moves in this direction. They apply the notion of 'audiovisual territories' to their investigation of the complex relationships among media (TV in particular), citizenship, the new Europe and a widespread cultural indifference to geopolitical processes. Graham and Marvin (1996) synthesize materialist approaches

with an awareness of the important contributions of cultural concepts to the emerging 'real' urban environment based on virtual cities, spatial technologies, convergent ITs and telematic social control. Graham and Marvin are based at the Centre for Urban Technology (CUT), University of Newcastle upon Tyne. CUT is committed to researching the 'poorly understood relationship' between technical networks such as telecommunications and transportation and the spatial, environmental and social developments taking place in cities today (CUT, 1996). CUT's synthesis of spatial approaches, cultural theory and focus on ITs is rare. So too are the interdisciplinary ventures undertaken and envisioned by Burgess, Morley and Robins, and Graham and Marvin. The work spearheaded by Couclelis, however, suggests that such efforts within British social geography – marginalized in American geography (but see Pickles, 1995) – may be on the upswing in the USA. Couclelis, sponsored by the National Center for Geographic Information and Analysis (1996), has organized interdisciplinary discussions of the converging issues of spatial technologies, accessibility, implementation and social control. On a more theoretical level, Kirsch (1995) analyses the interplay between technology generally and the increasing interconnections between the places of the world.

Telematics and ITs are technologies of control, their entertainment spin-offs notwithstanding – though such spin-offs deflect critical review of their military origins while generating corporate profit. Mattelart, one of the few critics to posit such linkages, writes (1994: xiii) that 'communication serves first of all to make *war*', and ITs' control extends to the imagination, a process akin to the function of propaganda. Levidow and Robins (1989: 172) conclude that ITs and telematics are based on assuming that all human needs can be fulfilled on the condition they are reduced to consumable goods and services within a 'phantasy of control' expressed as a 'flight from the world'. The authors suggest that support for individual freedom is undermined by these technologies, which substitute *information* for the individual as the focal point of history. I would add that in the mean time, off-screen and off-line, locality cedes agency to the network as part of what is given up in return for accessibility to the spatially diffuse global net increasingly positioned as coeval with competitive economic decision-making.

VI Rethinking communication geography

Humanism and social constructionism are often positioned as adversarial theories, though both share a suspicion of nonhuman agency. In geography, this shared suspicion is arguably observable in the similar approaches to technology manifested by such divergent groupings as empirical Marxists and poststructuralist cultural geographers. Both approaches implicitly treat communication technologies as a consequence of social relations, and not as constitutive of or active in their production. It is understandable that contemporary practitioners seek to avoid the futurology, forecasting and technologically determined approaches that characterized 1970s communications geography research. Gottmann's (1977: 303) critique still stands: 'many of these statements are projections into the future, based on fragile assumptions of what the writers believe people want.' Political economy and Marxian approaches do acknowledge a central role for ITs as spatial devices. New cultural approaches, however, though comfortable with 'landscape' as an organizing metaphor, have yet to consider seriously how communication technologies *per se* (and not the media or how the technologies are used by various actors) similarly might help reformulate concepts of identity and self (though see Light, 1995).

Geographers, with their access to sophisticated conceptualizations about space, spatiality, place and the construction of material landscapes according to landscape-as-idea, have a stake and a claim in positioning themselves more centrally in contemporary debates about how communication technologies and ITs relate to the production of meaning and identity. That geography, in general, has failed to do so, or has relied on other disciplines to generate theory about communications, suggests the continued saliency of Appleton's 'Cinderella' lament with which I began this article: communications geography remains a poor step-sister in the 'family' of human geographies. Yet everywhere we interact with and are increasingly surrounded by the artifacts and effects of communications and communication technologies. In effect, the ball is in full swing.

In order to help provoke a dialogue about communication technologies' relationship to people and places, I will briefly consider the relationship between technologies and the humans who desire them built. I noted above that a wide-ranging assertion holds technology as only a tool. This precludes consideration of the social relations already factored in to the technology by the scientific procedures leading to its development. As Dreyfus (1992) notes, the west has a penchant for building its philosophies as technologies. However, it is, perhaps, more culturally reassuring to subsume technology theoretically into the metaphors of medium or conduit rather than to acknowledge any possibility of a technology's agency, however partial, contextualized or inadvertent this might be – whether this agency results from unanticipated effects, applications or poorly thought-through research and design decisions on the part of its markers. The 'tool' approach concludes that communication technologies only mediate social relations, acting as containers or conduits through which meanings, social relations and agents 'pass' without being influenced by the passage. This begs the question 'why invent a technology in the first place?' if it is somehow to be argued or believed that the technology has no power to alter the state of the lived world, or the social relations contributing and existing prior to the technology's introduction.

Tool and conduit metaphors also deflect considering how an increase in technology's scale can increase its social effects. The word technology's root lies in the Greek *techné*, which is a mode of knowing 'the rules and practices that allow an action to achieve its ends' (Foucault, 1988: 15), and 'the name not only for the activities and skills of the craftsman, but also for the arts of the mind and the fine arts. *Techné* belongs to bringing-forth, to *poiësis* ...' (Heidegger, 1977: 13). *Techné's* connection to *poiësis* illustrates the idea that a 'bringing forth' manifests itself as the desire to make or build; it is caring about what one sees that brings forth this desire (Sennett, 1991: xiii). Caring is also foremost about what is at hand and in place – hence its applicability to the small-scale production of hand-held tools. This linkage between *techné* and tool still applies to how technology is theorized, and a contemporary unproblematized insistence on premodern cultural meanings that inhere in this linkage ignores distinctions between scientific knowledge and its practical applications as technologies. Over time, the accumulation of matters of degree can amount to a difference in kind. To blur the scale of a tool with the global scale in which networked ITs operate diverts attention from considering the manner in which specific kinds of agency and meaning have been systematically handed over to technology over several hundred years. I would suggest the current moves to theorize people and technologies as 'actor-networks', or as inter-relating 'arrangements of social practices', reflect academics' undeniable recognition that their own lives increasingly are mediated in important ways by ever-greater *quantities* of all manner of electronically mediated communications and communication technologies.⁶

According a potential of agency to technology would acknowledge more centrally the potential that contingency and change might also be factors escaping ironclad human control. There is an all-too-easy link between ignoring contingency and change, and what Langdon Winner (1993: 439), in his critique of social constructivism's approach to technology, identifies as the 'almost total disregard for the social consequences of technical choice'. Winner criticizes social construction's too rigid reliance on its 'strawman: technological determinism' and the resulting failure to examine fully the 'often painful ironies of technical choice' (both citations 1993: 446). He finds that social constructivists resurrect the old positivist 'value neutrality' in the relativist guise of 'interpretive flexibility' (1993: 447) when they argue that ethical issues raised by technology are undecidable because multiple readings of the 'text' (technology) are possible. Or, as Latour (1993) would have it, social constructivists are adhering to modernism's semi-explicit guarantee that science and the technology it produces, and politics and the social relations it influences, are mutually exclusive spheres.

Consider the telephone. It is devised to further communication across space and at greater speed, and is put into the service of social relations. Rothenberg (1993: 14) argues that when the potential of a technology such as the telephone is realized, its discursive and material usages – both as a thing external to ourselves and as a mechanism for extending our reach – then work further to suggest new intentions. Such intentions include, for example, a shift in telephone deployment from short business communications towards 'keeping in touch' with friends, accessing the Home Shopping Channel or QVC, and connecting the phone via modem to data-transmission facilities. New uses harken back to human intention; from the user's newly expanded vantage point informed by telephony, new technologies are imagined by scientists and the broader sphere of social relations. Stated otherwise, technology is an activity (Lyon, 1994). It helps realize human intentions and, in time, inscribes these on to environments. As Haraway suggests, 'to talk of a world as a congerie of practices doesn't mean that all the actors are like us'.⁷

Whatever their scale, technologies operate in place. They reconstitute the meanings of places by becoming part of them, by linking them, or even by disarticulating them, sometimes through an appropriation to the technology of qualities earlier ascribed to material places. Consider, for example, the programme implicit in the metaphors *cyberspace* and the electronic *frontier*. The greater the technology in any one place, the greater its influence on social relations and the natural world and its potential both to disarticulate the two and to substitute for either or both. This ability to substitute is particularly evident in VR, which creates a 'world' whose ontological ground rests on the millions of data bits programmed by software designers. None the less, it is hard to argue, for example, that should the tides of the Bay of Fundy be 'harnessed' for their electrical power, we would then be able to suggest the tides were a product of social relations, anymore than we might imagine electricity issuing from the ebb and flow of the tidal bore without human mediation or intervention. Humans are not the only agents in the world, and humans creatively engage with the products of our own making.

Miles and Robins (1992) address the social sciences' lack of synthesis in theorizing technology. Like Latour and Haraway, they suggest that technology is not only mechanisms, or tools, but also sets of social practices depending on knowledge and skills, which interact with 'the non-living physical world' and are fundamentally integrated with other social practices: '[I]nstead of talking about the "impacts of technology" we would talk about the co-evolution of technological and other social practices' (Miles and Robins, 1992: 21). Bingham (1996) critiques the modernist stalemate between

technological determinism and social construction. He warns that the former still lives and provides a most useful summary of recent work considering technologies and social relations as interplays of actor-networks. A complementary approach is offered by Hinchliffe (1996). He argues against deterministic approaches to technology and reminds geographers that mapping always excludes the uncategorizable. Instead, Hinchliffe suggests, we must remain open to multiple outcomes.

With respect to any future communication geography, technology and social relations need to be understood as an interlocutory set of processes and less as a series of discrete events (too) conveniently parsed for analysis. If there is to be greater activity in communication geography, it will come, in part, due to the increasing recognition that both technological determinist and social constructionist approaches participate in a causal determinism based on a Newtonian and linear understanding of time in which cause produces effect (see Menser and Aronowitz, 1996). In this article I have argued against event and conduit and in favour of processes. This understanding is implicit in Appleton's (1962) model that won't sit still. He is acknowledging that communications are processes occurring in places and not fully reducible to the spatialized event, pattern or even to Warntz's reductive 'pattern of patterns', which in the end is a frozen moment or big picture amenable to empirical and positivist approaches. So, if I argue that I look to technology *and* social relations as communicatory processes, I am also saying that technologies have intended effects. In the case of television, for example, it is impossible always to remain the totally active reader posited by reception theory. To theorize individuals as always succeeding in resisting the dominant readings intended by the makers of popular culture implies a denial of the limits of politics and suggests superhuman abilities, as if people never faltered or tired. Further, television images work their magic in ways that are different from print. That said, we also participate in how technologies get used; hence social construction arguments have something to say, underacknowledged descendants of humanist approaches though they may be. Yet determinism, whether of the technological or social variety, cannot fully come to terms with the conceptual messiness of process. In part this is so because process resists analysis. And as Appleton understood, it is difficult to model. Philosophy, however, can study process. So can the novel. The seventeenth-century concept of synergy, by which the total effects are greater than the sum of individual components, implicitly acknowledges process. Future work in communications geography must move towards new theorizations of process that allow for the unmappable. Ironically perhaps, as a concept and as material realities, place and places offer geography what can be thought of as a radically old (Walter, 1988) means of coming to terms with the issue. As an approach, place – understood as a fuzzy-bounded relational field of fluid natural and social processes, positioned across a range of scales, and holding together hard-bounded things such as computer terminals, and intangibles such as human intent – can contribute greatly to a newly invigorated geography of communication.

Acknowledgements

I would like to thank Michael Petit for his generous contribution in reading and critiquing earlier drafts of this essay. He has a keen eye and a crisp editor's mind. Thanks also are due to the editor of *PIHG* and the anonymous reviewers. The Social Science and Humanities Research Council of Canada provided financial support for the dissertation from which this writing is drawn.

Notes

1. Sack (1980) notes that distance does not equal space. My sense is that he makes this assertion in part because so many geographers make this mistake. They believe in a geometric Void in which distance becomes almost an anti-human (and natural) vacuum or 'tyrant' to be overcome. Conflating distance with space is to see distance, and therefore space, as impediments to communications, rather than to grasp distance and space, taken together, as a drawing together of existential presence and metaphor as a necessary condition allowing communication to happen; that is, *necessary* if we are to continue to exist as separate bodily entities.
2. Even Kellerman's insight assumes an implicit connection of the tangible and the visible, as if to say what cannot be seen has no material reality.
3. Carey's argument supports Ullman's (1954: 311) contention that technical change reduces unit costs; it also increases circulation of goods. Subsequent regional economic specialization lessens self-sufficiency and increases interdependence.
4. As Cronon (1991: 120) notes, Chicago's Board of Trade was founded in 1848, the same year the telegraph reached that city.
5. Daniel Bell's (1973) reformulation of Arthur Penty's concept of postindustrial society (Mattelart, 1994: 129) also attained prominence during this period.
6. Ferré (1995) offers this example which supports the argument I am making here: the (naturalized) view that the human mind is a computer is reflected in such phrases as 'he was programmed to do it', or 'why don't you process this a bit more?'
7. Haraway's observations were given in response to a question I posed, inquiring how technology's agency might be incorporated within contemporary theory while avoiding 1) the accusation and the pitfalls of technological determinism *per se*; and 2) contributing inadvertently to a ceding of control by humans to machines. The citation is from personal notes. From the AAG 1995 Chicago annual meeting, 'Harvey and Haraway: debate and discussion', Saturday, 18 March 1995. A transcription of this discussion is printed in *Society and Space* 13, 507–29.

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