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Segueways into cyberspace: multiple geographies of the digital divide

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Abstract. Despite stereotypes that cyberspace spells the 'end of geography' and promises universal, democratic entree to the electronic highways of the world economy, access to the Internet is highly unevenly distributed both socially and spatially. In this paper I examine the geopolitics of Internet access and its implications. I open by situating electronic communications within contemporary social theory, emphasizing cyberspace as a contested terrain of competing discourses. Second, international discrepancies in access are illustrated, dramatizing the ways in which the Internet enhances the advantages enjoyed by a global elite consisting largely of white, male professionals. Third, I turn to discrepancies in Internet access within the United States, including class, racial, gender, and spatial disparities. I seek to demonstrate that geography still matters; the Internet creates and reflects a distinct spatial structure interlaced with, and often reinforcing, existing relations of wealth and power.

The vast expansion of telecommunications at the end of the 20th century has been fundamental to the formation of what Castells (1996; 1997) labels the "informational mode of production" dominated by "spaces of flows". Despite the relative invisibility of communications as a subject of inquiry within geography (Kitchin, 1998a; 1998b), a substantial literature has examined the social and spatial dimensions of telecommunications and cyberspace (Gibbs and Tanner, 1997a; 1997b; Graham, 1998; Hepworth, 1990; Hillis, 1998; Schiller, 1999; Tapscott, 1995; Warf, 1995). Electronic communications form a fundamental part of the growth of post-Fordist production regimes around the world and have contributed to a massive, planet-wide round of time – space compression that has reconfigured the structure of social relations and the rhythms of everyday life. Within cities, digital networks have contributed to a substantial reconstruction of urban space (Graham and Marvin, 1996; Mitchell, 1995), including telecommuting, the on-line provision of private and public services, entertainment, and public and private information of multiple forms. In such an environment, "being digital" is increasingly critical to knowledge, wealth, status, and power (Negroponte, 1995).

Incontestably, the Internet is the largest electronic network on the planet, connecting (in March 2000) an estimated 300 million people in more than 150 countries (NUA Internet Surveys, at www.nua.ie/surveys/how_many_online/index.html). Even more important is the stupendous rate of growth of Internet users: spurred by declining prices of services and equipment and enormous media hype, the number of people on-line worldwide has doubled every year for the last decade. This rate of increase conforms to Metcalfe's law, which holds that the value of a network is proportional to the square of the number of users (Zipf, 1946). Indeed, the Internet may be the most rapidly spreading technology in human history (Schiller, 1999).

Unfortunately, the only thing to grow more quickly than the Internet is the hyperbole surrounding it. Popular imagery of the Internet rests on two interrelated fantasies, both reflective of a dominant technological determinism that pervades media representations of cyberspace. The first is that everyone has, or theoretically could have, equal access to cyberspace; in other words, the Internet is inherently democratic. The second stereotype is that the Internet eliminates space, overcoming the friction of

distance through the creation of communities without propinquity (Cairncross, 1997). In this paper I contend that both these premises are deeply flawed, and that their widespread acceptance has done great violence to analyses of cyberspace sensitive to social and spatial inequalities. A necessary corrective to this utopianism is to embed an understanding of the Internet within wider theorizations of social structure, class, and power, a task to which I turn in the first section. Although most treatments of telecommunications suffer from a studied neglect of matters political, it is abundantly clear, as Hugill (1999) has demonstrated, that communication systems have been deeply interwoven with global and local geopolitics for more than a century and a half. Contrary to utopian pronouncements that everyone can or will drive on the information highway, in the second part of this paper I empirically document discrepancies in access to the Internet internationally, revealing that the global geography of cyberspace closely resembles the schism between the economically developed and underdeveloped worlds. In the third section, I demonstrate that even within the most hard-wired of nations, the United States, severe imbalances in Internet access among social groups and regions are evident.

Power, knowledge, and the Internet

Early postindustrial theorists such as Bell (1980) and Toffler (1980) fantasized that electronic communications would have inherently democratic impacts, facilitating equal access to data and knowledge regardless of social standing or geographic location. In this ahistorical and overly individualistic interpretation of power and knowledge, electronic systems are devoid of social roots and serve only emancipatory interests. Former US House Speaker Newt Gingrich, for example, once argued that the federal government should subsidize a laptop computer for every ghetto child as the key to an adequate education, as if one machine could rectify the damage wrought by enormous and prolonged social deprivation. Advocates of this perspective argue that the Internet allows for unfiltered, nonhierarchical flows of information (for example, Baldwin et al, 1996), a raucous, highly democratic world with no overlords and numerous countercultures of hackers (Mungo and Clough, 1993). In the bedlam of unregulated anarchy, everyone has the right to seek and express information electronically. One variant of this theme holds that cyberspace resembles the 19th-century US West: vast, unmapped, and legally ambiguous. For example, the Electronic Frontier Foundation, one of the prime defenders of civil liberties on the Internet, contends that:

> "In its present condition, cyberspace is a frontier region, populated by the few hardy technologists who can tolerate the austerity of its savage computer interfaces, incompatible communications protocols, proprietary barricades, cultural and legal ambiguities, and general lack of useful maps or metaphors. Certainly, the old concepts of property, expression, identity, movement, and context, based as they are on physical manifestation, do not apply succinctly in a world where there can be none" (www.eff.org).

These claims of unfettered individualism are ironic given the very public origins of the Internet and the critical role of government regulatory policies. The Internet began in 1969, when the US Department of Defense founded ARPANET, a series of electronically connected computers whose high-capacity transmission lines were designed to withstand a nuclear onslaught (Hafner and Lyon, 1996); indeed, the durability and high quality of much of today's network owes its existence to its military origins. In the 1980s, the European Particle Physics Lab (CERN) developed hypertext, HTML, URLs, and HTTP, which gave birth to the World Wide Web. In 1984, ARPANET was expanded and opened to the scientific community when it was taken over by the National Science Foundation (NSF) in 1988, becoming NSFNET. The 1990s dra-

matically reconfigured the regulatory environment governing Internet access. In 1995, NSF relinquished its stewardship role over the Internet; the resulting competitive market for digital services has hampered efforts to identify trends.

Meanwhile, an enormous wave of mergers and acquisitions dramatically altered the market structure of telecommunications. Corporate providers, spurred by deregulation, globalization, and technological changes, have steadily consolidated into a shrinking pool of suppliers that enjoy significant economies of scale and scope. Consolidation of carriers has extended across traditional market boundaries to blur the traditional distinctions between telephone, Internet, and cable television firms. Globalization and the digital revolution dramatically changed the competitive environment and undermined the antitrust model prevalent since 1984. In the United States, the Telecommunications Act of 1996 changed foreign ownership controls, allowing telecommunications firms to acquire and control foreign firms, and relaxed cross-industry ownership rules, allowing firms in one telecommunications sector to operate in and control firms in another (Chan-Olmsted, 1998; Tseng and Litman, 1998). Digital convergence—the blurring of the traditionally separated industries of telephone, cable, and computers—allows telecommunications conglomerates to provide more than one service/product over the same medium. For example, telephone networks provide video and data communications services, cable modems carry high-speed data and voice-switched messages, while computer networks transfer voice and video data. New technologies create an incentive that makes mergers and acquisitions attractive to firms wishing to position themselves for a leadership role in emerging global media and telecommunications markets. Proponents of the Act argued that it would increase competition and provide consumers with lower prices and greater choices; instead, the industry responded with record-breaking mergers. To the extent that mergers reduce market competition, they hamper improvements in service efficiency and equity. These trends encouraged telecommunications providers to offer services on a 'pay per' basis, a context in which firms engage in network 'cherry-picking' of the most profitable customers and effectively abandon others, such as rural regions and inner cities, which traditionally acquired service only through government-mandated policies forced upon state-supervised monopolies (Graham and Marvin, 1996).

The Internet also witnessed steady encroachment by corporations for commercial purposes, primarily on-line advertising and shopping (Cooke and Lehrer, 1993; Cronin, 1996; Schiller, 1993; Tapscott, 1995). Indeed, 'e-commerce' has expanded even more rapidly than the Internet itself; by 1998, the total volume of Internet retail markets in the United States alone was estimated at more than $2 billion, a phenomenon particularly important to highly educated, high-income groups (Jimeniz and Greenstein, 1998; Schiller, 1999). 'Digitally dispossessed' consumers risk having limited quality selections at higher prices. Airlines, bookstores, and phone companies, for example, offer special prices for their on-line customers, although competition from on-line retailers could put pressure on off-line stores to improve services and prices.

The rapid growth of digital systems and the delayed development of an adequate conceptual framework to understand them have made urgent the need for theoretically informed analyses. Unfortunately, most efforts to address the 'digital divide' have taken a decidedly technical approach to what is essentially a social and political problem, focusing on hardware and engineering concerns rather than the politics of information. Recent literature on the relations between knowledge, power, discourse, representation, and geography, much of which is inspired by poststructuralist social theory, has contributed significantly in this regard (Cosgrove, 1985; Cresswell, 1997; Duncan and Sharp, 1993; Lefebvre, 1991). The analysis of cyberspace is thus part of a much broader debate about the nature of representations and the discursive construction of space

(Graham, 1998). Orthodox views typically portray representations as claims to truth, not attempts at persuasion; in this view, objectivity is both possible and necessary, and the act of interpretation is unproblematic. This perspective has increasingly given way to deconstructionist interpretations that emphasize the social origins and consequences of representations (Barnes and Duncan, 1992). Representations are always authored, situated in a context, always partial and biased, and the manner in which they are interpreted and consumed is not necessarily how they are intended or produced: meanings generally escape their authors. Although discourses often become taken-for-granted as 'natural', acquiring an asocial 'objective' status, there can be no value-free representations which are inescapably linked to power relations. For example, Harley (1989; 1990), Monmonier (1991), and Wood (1992) revealed maps to be discourses, laden with power relations, which constrain perceptions of space along some avenues and not others. Similarly, Pickles (1995) argues that geographic information systems have become implicated in the discursive rewriting of space, essentially underpinning a resurgence of positivist thought. Approaching cyberspace as a socially constructed discourse that simultaneously reflects and constitutes social reality allows us to focus on its social consequences (although they are not always intended ones), as they become part of the social reality that they describe: word-making is also world-making.

When framed this way, communications technologies can be seen as part and parcel of a broader ensemble of historically and geographically specific social relations in which production and reproduction systems, transportation and communications, and the state are all woven together as articulated moments of global capitalism. Graham (1998) notes that the simple technological determinism that holds that telecommunications simply shape space has been challenged by a political economy that emphasizes the *coevolution* of communications and space. Like other telecommunications systems, the Internet is a social product, interwoven with relations of class, race, and gender, and inescapably subject to the uses and misuses of power (Gibbs and Tanner, 1997a; 1997b; Jones, 1995; 1997; Shields, 1996). Telecommunications are not inherently emancipatory, freeing people from 'the tyranny of distance', as they can be used to monitor everyday life, including credit cards, visas and passports, tax records, medical data, police reports, telephone calls, utility records, automobile registration, crime statistics, and sales receipts (Lyon, 1994). In this light, the Internet is more akin to Foucault's (1972) famous metaphor of the panopticon that surveys and controls all it sees than to some mythical unfettered frontier region populated by hardy individualists.

In short, the nature and impacts of the Internet are contingent and politically contested. *Contra* the postindustrialist, utopian perspective so popular with the mass media, social categories of wealth, power, and place are inevitably reinscribed in cyberspace. The unfortunate tendency in the popular media to engage in technocratic utopianism has largely obscured these power relations. These themes are readily evident in the topography of wealth and power that circumscribes access to the Internet at the global level.

International discrepancies in Internet access

The Internet expanded onto a national and global scale via its integration with existing telephone, fiber optic, and satellite systems (Press, 1997), a process made possible by the innovation of packet-switching and TCP-IP protocols in which individual messages may be decomposed, the constituent parts transmitted by various channels, and then reassembled, virtually instantaneously, at the destination. Yet, despite its rapid diffusion, profound spatial inequalities in access to cyberspace exist across the globe; indeed, given the US and European dominance, the 'World Wide Web' hardly lives up to its name. Inequalities in access to the Internet internationally reflect the long-standing

bifurcation between the First and Third Worlds. Although virtually no country is utterly without Internet access (although portions of Africa come close), the variations among nations in relative accessibility are huge (Dodge, 1999). Given its large size, the United States dominates when measured in terms of absolute number of Internet hosts (table 1 and figure 1). In terms of hosts per 100 000 individuals—perhaps the best index of accessibility—the leading nations are in Scandinavia, Canada, and Australia; the United States, surprisingly, is relatively low in this regard, a reflection of the vast population of poorly served people (figure 2, see over). In Europe, the greatest connectivity is in relatively wealthy nations such as Germany and the United Kingdom; Eastern Europe lags considerably behind the West, as do the nations of the former Soviet Union. In Asia, access is by far the greatest in Japan, and to a lesser extent in the newly industrializing countries, particularly Singapore. Less than 1% of China is hooked up. The Internet on the African continent is essentially confined to South Africa. In all cases, per capita incomes are the key. Variations in the number of users are also reflected in the geography of Internet flows (although flow data are much harder to come by than are place-specific attribute data): 90% of all international traffic on the Internet is either to or from the United States, fueling fears that the Internet is largely a tool for the propagation of American culture internationally; indeed, for large numbers of the planet's inhabitants, globalization is synonymous with 'Americanization'.

Table 1. Internet hosts, January 2000 (source: compiled by author from data at Network Wizards, www.nw.com).

Geographical region	Number of Internet hosts
Europe	9 942 393
Asia	4 016 916
North America	3 550 387
Oceania	1 382 536
Latin America	1 140 985
Former USSR	308 678
North Africa and the Middle East	270 981
Sub Saharan Africa	180 101
Caribbean	16 900
World total	20 809 877

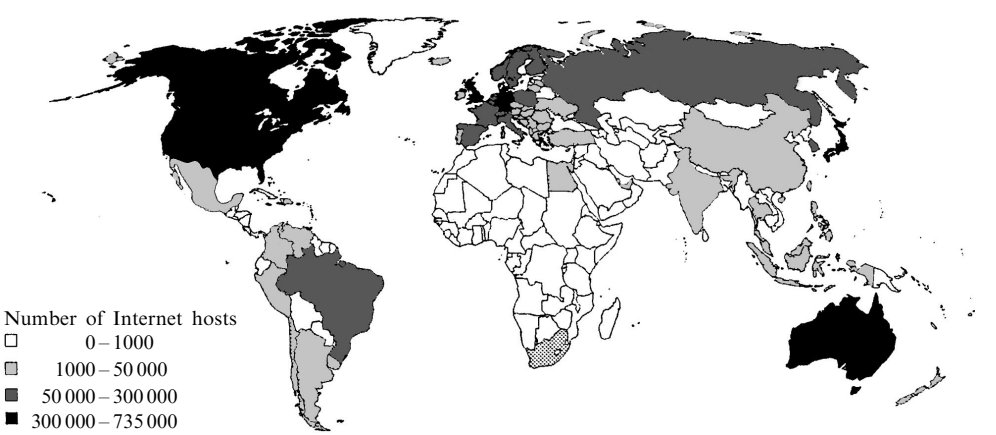

Figure 1. International distribution of Internet hosts, January 1999 (source: compiled from data at www.nw.com/zone/WWW/dist-byname.html).

Figure 2. The number of Internet hosts per 100 000 persons, January 1999 (source: compiled from data at www.nw.com/zone/WWW/dist-byname.html).

Estimates of the number of Internet users by major geographical region in March 2000 are provided in table 2. Of the roughly 300 million users that constitute the global cybervillage, two thirds live in North America and Europe. Outside of the global core, the vast bulk of the world's people, particularly those in the Third World, have little to no access, a reflection of centuries of colonial occupation and their modern institutional legacies (Harpold, 1999). To speak of the Internet as liberatory in impoverished social contexts such as Mozambique or Bolivia, with high illiteracy rates and few telephones, is absurd. What is more, within such nations network nodes are invariably concentrated within cities, whereas the plurality, and often the majority, of the population lives in rural areas. With slow connections and out-of-date telephone systems, graphical information—which uses much more bandwidth than text—is virtually out of the question. Under such circumstances, claims of cyberactivism as a substitute for real political change are misleading and dangerous.

Global access to the Internet is deeply conditioned by the density, reliability, and affordability of national telephone systems, which form the heart of the architecture of cyberspace. For this reason, the distribution of Internet hosts also mirrors the enduring legacy of the superpower bifurcation during the Cold War: Soviet-backed regimes distrusted the telephone, which allows two-way communication, and preferred television, which allows only one-way flows of information. Most Internet communications occurs along fiber-optic lines leased from telecommunications companies (which carry 80% of international communications), many of which are state regulated, in contrast

Table 2. Estimated number of Internet users, March 2000 (source: NUA Internet Surveys, www.nua.ie/surveys/how_many_online/index.html).

Geographical region	Number of Internet users (millions)
Europe	83.3
Asia and the Pacific	68.9
North America	136.9
South America	10.8
Middle East	1.9
Africa	2.6
Total	304.4

to the largely unregulated state of the Internet itself. Prices for access vary by length of the telephone call, distance, and the degree of monopoly: in nations with telecommunications monopolies, prices are 44% higher than in those with deregulated systems (*The Economist* 1996). The global move toward deregulation in telecommunications, which started with the breakup of AT&T and the privatization of British Telecommunications and which has spread rapidly in many countries, will likely lead to more use-based pricing and fewer cross-subsidies (for example, between commercial and residential users), a trend that is likely to make access to cyberspace less affordable to low-income users worldwide.

The constraints to Internet access are not only economic but also political, given that the electronic dissemination of knowledge can challenge established relations of power. Many governments have come to fear the Internet for its emancipatory capabilities. The Chinese government, for example, stung by students' use of fax and e-mail during the 1989 Tienanmen Square massacre, limits access to Internet nodes (Adams, 1996; Rosenthal, 2000). Private satellite dishes are still illegal in China. Singapore, no model of democracy, censors electronic information with a national standards review board. In 1996, the Guatemalan government, using the state-owned telecommunications company, Guatel, made private satellite or telecommunications links to the Internet illegal. In 1996, the US Congress passed the Communications Decency Act (CDA), an attempt to limit children's access to pornography (however loosely defined) on the Internet by facilitating government censorship, essentially catering to the political agenda of the Christian Right. The Supreme Court overturned the CDA, granting the Internet the same First Amendment protection as print, not the lower standard applied to broadcasting, on the grounds that cyberspace is not as 'invasive' as radio or television.

The Internet has been harnessed for progressive purposes as well as reactionary ones (Warf and Grimes, 1997). Mexico's Zapatistas, for example, successfully deployed cyberspace to influence popular opinion for their cause (Froehling, 1997). O'Lear (1996) describes how environmental activists in Estonia and Russia cooperated using e-mail to combat the degradation of a nearby lake. Dozens of 'countrynets' report human rights abuses in closed political systems around the world, including China, Burma, Kenya, and East Timor (Neumann, 1996), providing material often unavailable through traditional media. Thus, the Internet does not necessarily serve reactionary or emancipatory purposes; it does both, emphasizing the need for a contextual theorization of its contingent and highly political nature. Like other spheres of social activity such as the workplace, household, or the state, cyberspace is a contested terrain, a battleground of discourses. The degree to which different groups of users employ its capabilities, of course, depends largely upon their technological sophistication (the need for which, at times, is not inconsiderable) and their access to high-speed machines and fiber-optic lines, all of which emanate from existing social relations.

Inequalities in Internet access within the United States

The United States offers a particularly appropriate case study given how well-endowed its Internet infrastructure is: with more than 3 million hosts, it not only has the largest national system by far, but also ranks among the world's highest ratios of hosts per capita. Yet even within this nation vast discrepancies exist in terms of wealth, gender, and race: although 42% of US households own personal computers, only 12% have modems (and thus networked machines at home). So severe have the inequities in Internet access become in the United States that mounting concern has risen in both federal and local policymaking circles over the 'digital divide' that puts those without computers and computer skills at a competitive disadvantage at work and school.

US Internet users are overwhelmingly white and middle class, well educated, and in professional occupations demanding college degrees. The National Telecommunications and Information Administration's (NTIA) 1999 survey found wide discrepancies in Internet usage rates by income and ethnicity (table 3). Although 80% of households earning over $75 000 per year own personal computers at home, only 20% of those earning $20 000 or less do so. Households within the highest earnings bracket are 20 times more likely than those in the lowest to own networked computers at home. The average household income of households with networked computers at home is $79 000, more than twice the national average (McConnaughey and Lader, 1998). Similarly, a survey of 1200 Internet users in southern California by the *Los Angeles Times*, found that they were overwhelmingly white and enjoyed above-average incomes (Harmon, 1996; Hoffman and Novak, 1998). Income discrepancies in Internet usage are compounded by educational levels, revealing a steady increase with years attained (table 4); college-educated households are almost 10 times as likely to use the Internet than those with elementary school educations.

Table 3. Percentage of households using the Internet by income and ethnicity, 1998 (source: NTIA, www.ntia.doc.gov/ntiahome/fttn99/FTTN_I/Chart-I-24.html).

Household income ($ thousands)	Ethnicity		
	white	black	hispanic
< 15	8.9	1.9	3.8
15 – 35	17.0	7.9	7.6
35 – 75	39.0	22.2	26.8
>75	60.9	53.7	48.1

Table 4. Percentage of households owning personal computers by educational level, 1998 (source: NTIA, www.ntia.doc.gov/ntiahome/fttn99/FTTN_I/Chart-I-27.html).

Educational level reached	Percentage of households owning a PC
Elementary	7.9
Some high school	15.7
High school	31.2
Some college	49.3
College degree or higher	68.7

Race and ethnicity are also major factors in shaping access to cyberspace, leading to fears of a "racial ravine" (Harmon, 1998; Hoffman and Novak, 1998). In the United States, 44% of white households possessed personal computers at home in 1999, but only 32% of black households and 25% of Latino households did. White households possessed *networked* computers at home 3 times more frequently than did black or Latino ones, and white households were 6 times more likely to use the World Wide Web than were black ones (NTIA, 1999). Asian – American households exhibited the highest Internet connectivity at all income levels, a reflection of their relatively high incomes and traditional emphasis on education. Given the close correlation between race and class in the United States, these findings are worsened when one focuses on low-income communities (Moss and Mitra, 1998). For two-parent households earning $35 000 or less per year (roughly the national median), the gap in personal computer ownership between white and minority households is more than 4-fold (McConnaughey and Lader, 1998). For these reasons, Bolt and Crawford (2000) refer to the Internet as the "World White Web", a striking appellation given that African – American households

have roughly the same access as do whites to other information technologies such as telephones, cellular telephones, and satellite television. For many minority children, the digital world holds little relevance or promise, a problem that lies as much within the domain of culture as it does within affordability. Latino households reported difficulty with English as one obstacle, and low-income residents of all ethnicities cited lack of computer skills and the short half-life of equipment as formidable barriers to getting on-line. Inadequate access is made worse by ignorance: in 1992, an astonishing 58% of Latino and African–American households earning under $25 000 per year were not even aware of the Internet's existence (Anderson and Melchior, 1995). Even so, low-income parents are frequently painfully cognizant that their children are deprived of Internet access, which they correctly perceive as necessary for their future employment prospects (Schement, 1998).

The class and ethnic biases are compounded by gender, and Internet use is heavily gendered (Doheny-Farina, 1996; Miller, 1996). In a culture in which many girls are not socialized to be scientifically literate and are frequently underconfident when working with machines, technology has long been predominantly a 'guy thing', and the Internet is no exception. Indeed, the entire computer industry is one in which males vastly outnumber females, and masculinity thoroughly pervades digital culture, including video games. Roughly 62% of all US Internet users in 1998 were male (NTIA, 1999). However, this proportion represents an improvement over the 82% of users who were male in the early 1990s. First-time users in 1998 were evenly split between males and females (Graphic, Visualization, and Usability Center, 1999). US women were more likely to be on the Internet than their European counterparts, where females account for only 16% of users. However, males and females of all ages exhibit different patterns of Internet usage: girls and women often make their use of computers contingent on what they need the computer to do, whereas males are typically more willing to experiment in free-form fashion (Bolt and Crawford, 2000).

These patterns are not unique to the United States. In the United Kingdom, Graham and Aurigi (1997) found that Internet users were similarly overwhelmingly white, middle class, and male. In both nations, differentials in access to the skills, equipment, and software necessary to gain entry to the electronic highway threaten to create a large (predominantly minority) underclass disenfranchised from the benefits of cyberspace. This phenomenon must be viewed in light of the growing inequalities throughout industrialized nations generated by labor-market polarization (deindustrialization and the growth of low-income, contingent service jobs), the growth of unearned income, and the regressive policies of the post-Keynesian state (in the United States, taxation policies that favor the wealthy). Modern economies are increasingly divided between those who are comfortable and proficient with digital technology and those who neither understand nor trust it, a development that disempowers the digitally dispossessed, denying them the possibility of citizenship in cyberspace. Indeed, those who may need access to such information the most—the poor and the relatively disenfranchised—may have least opportunity to purchase or use it. Despite the falling prices for hardware and software, basic entry-level computers for Internet access cost roughly $1000, which is an exorbitant sum for low-income households. (For example, the US government's definition of poverty for a family of four is about $16 000 per year.) For such families, upgrading to a new model every 3 to 5 years is out of the question. For employees stuck in low-paying jobs that do not offer access to the Internet at work, the obstacles are formidable, including cost and lack of familiarity with computer systems. By excluding those lacking the requisite software skills, the Internet becomes an effective 'screening tool' for employers.

But what of popular access systems such as Compuserve, America-On Line, or Prodigy, which allow anyone with a modem to hook in? On the one hand, the popularity and rapid growth of such systems, which now connect about 15% of the US population, reflect their appeal to large numbers of users. However, even there social and spatial constraints are evident. Most obviously, one needs access to a computer and modem, which even in a well-connected country such as the United States, only one eighth of households possess. Second is the matter of telephone costs, which in many cases can be substantial. For low-income households, now under assault from conservatives as the cause of everything from unemployment to the federal deficit, a choice must often be made between food and heat, or food and rent; a high telephone bill, especially for a luxury such as the Internet, is out of the question. Current attempts to levy charges on Internet use, hitherto virtually free, will exacerbate this problem further as the logic of privatization is extended further into cyberspace.

Nor does the public educational system offer an easy remedy. The wide discrepancies in funding and the quality of education among US school districts, particularly between wealthy suburban and impoverished central city schools (Kozol, 1991), reinforce inequality rather than mitigate it. In wealthy districts, 94% of schools have Internet access, while the proportion in low-income ones drops to 84% (Hafner, 2000). However, slow Internet connections are not very useful, and poorer schools are typically saddled with slow 56 kilobits per second (kbps) connections, which are fine for e-mail but deny students the experience of the full scope of the Internet. Only 16% of schools in low-income communities have Internet access to high-speed T1 lines, compared with 37% in wealthy ones (McConnaughey and Lader, 1998). The Internet is accessible through some local libraries, such as the public access networks now in place in many cities (Guthrie and Dutton, 1992). Use of public access Internet facilities is predominantly confined to low-income minorities. Although such systems aid citizen interactions with local government as well as with one another, there are currently only about 80 such systems in operation in 29 states (Schuler, 1996). Financial constraints in many municipalities, however, have curtailed the growth of these systems (Norris and Kraemer, 1996).

Bluntly, for the very poor, simple access to networks may be next to impossible (Resnick and Rusk, 1996). Even within the most digitized of cities there remain large pockets of 'off-line' poverty (Thrift, 1995), in which the poor and disenfranchised (typically the familiar litany of minorities) women, and the economically disadvantaged enjoy few of the benefits associated with the expansion of the Internet. Those who need the Internet the least, already living in information-rich environments with access through many non-Internet channels (such as newspapers and cable TV), may have the most access to it, while those who may benefit the most may have the least chance to log in. Indeed, the 'information-poor' are typically unaware of the massive economic, technological, and political changes that exclude them further from the 'information society' with each passing day; many have never touched a keyboard and will never purchase a computer or use one at their place of work. Such issues raise serious concerns about the role of communications technologies in fostering an inclusive and egalitarian society. Steps to remedy these discrepancies include expanding local library access, initiating technical career centers in low-income neighborhoods to facilitate computer skills acquisition with mentoring programs, and encouraging commercial providers to subsidize underserved market segments (McConnaughey and Lader, 1998).

Not surprisingly, these social inequalities are matched by geographical ones (Wheeler and O'Kelly, 1999). Since its inception at the hands of the US military, the very architecture of the Internet has revolved around a handful of nodes that route Internet traffic, all of which have been clustered in cities of academic or governmental

significance. The privatization of the network, which began in 1993 with NSF's transfer of the system's management to a consortium of private firms, brought these nodes into conformity with the dictates of the market. The resulting patterns of service provision became steadily restructured by corporate Internet Service Providers in partnership with backbone providers (such as AT&T, MCIWorldcom, and Sprint), generating a geography centered largely on large metropolitan areas, whose concentrations of affluent users generate economies of scale that lead to the highest rates of profit. Connecting the major nodes of the Internet is a skein of high-capacity fiber-optic lines, the Internet's backbone, which have increased 10 000-fold over the last decade (*The Economist* 1996). The largest fiber optic lines (T-3, OC-3, OC-4, and OC-12) connect a handful of large urban areas (figure 3), whose comparative advantage in producer services has benefited significantly by publicly installed telecommunications systems. Although the largest metropolitan regions are well served (particularly New York, Chicago, Washington, DC, Atlanta, Los Angeles, and Seattle), many other areas (such as the rural South) have few connections. High-capacity fiber-optic lines are particularly important in regard to access to high-density material, such as graphical content on the World Wide Web. For high-volume users (typically large service firms), for whom the copper cables used by telephone companies are hopelessly archaic, these lines are an absolute necessity.

Another measure of the uneven geography of the Internet is the distribution of host sites. Five states—California, Texas, Virginia, New York, and Massachusetts—contain one-half of all Internet hosts in the United States, and five metropolitan areas account for one-third of all hosts. Figure 4 (see over) reveals the number of Internet hosts per capita in 1999 among US counties: well-endowed regions include relatively prosperous

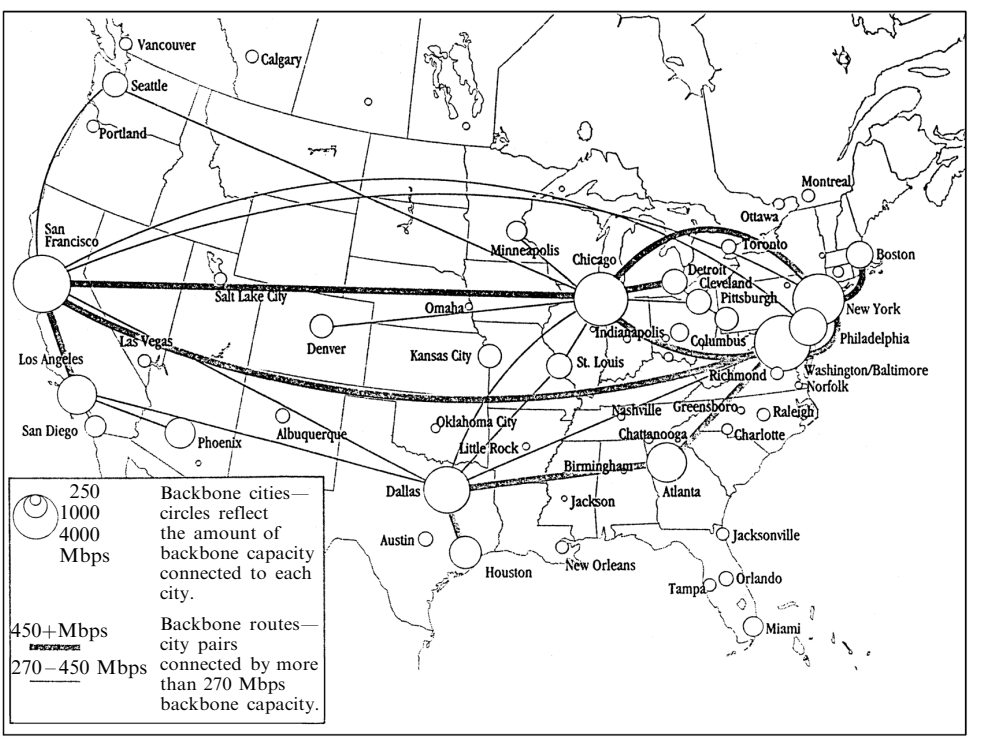

Figure 3. High-capacity Internet lines in the United States, 1997 (source: Matrix.Net, www.matrix.net).

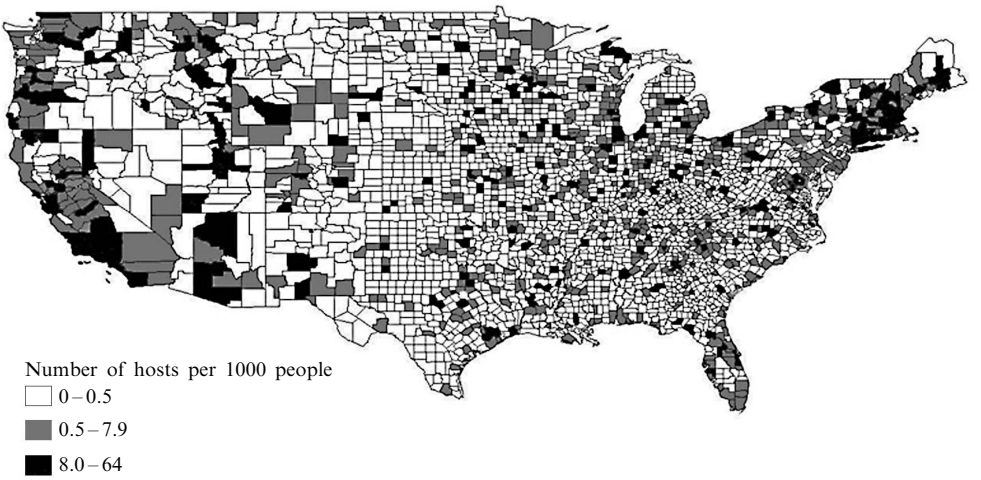

Figure 4. The number of Internet hosts in the United States, January 1999 (source: redrawn from Matrix.net, www.mids.org/mmq/303/pubhtml/country.gr.us.patch.html).

northern and southern California, home to much of the nation's electronics industry, while vast swaths of low-income rural areas in the Midwest and the South are underrepresented.

Geographical inequalities are also evident among consumers as well as providers. Ownership of personal computers—for most users, a prerequisite to ready access—varies considerably among states, ranging from a high of 55% in Alaska to a low of 20% in Mississippi. The distribution of households with on-line service also varies spatially, a pattern largely characterized by a rural–urban split (table 5) in which urban residents usually have greater access regardless of income level.

In all regions, the urban–rural divide looms large: telecommunications infrastructures always incur dauntingly high marginal costs in low-density regions (Grimes and Lyons, 1994), and in an age of privatized providers drawn to the enormous scale economies in metropolitan areas, low-income rural regions have replaced low-income inner cities as the least-connected places within the United States (NTIA, 2000). The average metropolitan resident is twice as likely as a rural one to be connected to the Internet at home or school. Two thirds of cities over 100 000 people have access to high-bandwidth cable modem technology, while only 5% of towns under 10 000 do so. Indeed, of 3115 counties in the United States, 1742 (the large majority rural ones) do

Table 5. Percentage of households using the Internet by urban and rural residence, 1998 (source: NTIA, www.ntia.doc.gov.ntiahome/fttn99/FTTN_l/Chart-I-21.html).

Household income ($ thousands)	Households using the Internet (%)			
	US	rural	urban	central city
<5	8.1	4.3	9.1	9.5
5–10	6.1	2.9	7.2	6.8
10–15	7.4	6.0	7.9	8.1
15–20	9.8	8.4	10.3	11.0
20–25	12.1	10.0	12.9	14.4
25–35	19.1	15.4	20.4	22.5
35–50	29.5	26.4	30.6	31.8
50–75	43.9	38.7	45.7	44.0
>75	60.3	53.7	62.0	59.7

not have a single point-of-presence (POP—the interface between long-distance trunk lines and local telephone switching systems) and thus are altogether excluded from the Internet. President Clinton's tour of native American communities in April 2000 drew widespread attention to the inadequate access to the Internet common to such regions (Wax, 2000). Furthermore, even when they are connected, rural residents are far more likely than urban ones to be frustrated by slow connections. Broadband technologies such as DSL (digital subscriber line) have been slow to reach rural parts of the United States: whereas 86% of residents in cities with more than 100 000 residents have access to DSL, only 1% in towns with fewer than 10 000 people do so (Greenman, 2000).

To some degree, public policy can ameliorate these social and spatial discrepancies (Bowe, 1993). The Clinton administration has moved more cautiously into the area of information technology than its rhetoric suggests. The initial step was to launch the National Information Infrastructure (NII), which, in 1994, Vice-President Al Gore promised would connect every classroom, library, hospital, and clinic in the nation by the year 2000. The NII Assistance Program extends grants to nonprofit organizations to purchase equipment, buy software, and train staff (McConnaughey et al, 1995). The Telecommunications Act of 1996 extended steps to reduce spatial inequalities by guaranteeing access to basic telecommunications services (Cooper and Kimmelman, 1999), an important step for low-income rural areas where the marginal costs of installation and maintenance are high. The most widely recognized federal government initiative is the E-rate program, which provides discounts for telecommunications services of 20% to 90% for public schools and libraries. The Federal Communications Commission initiated two programs for low-income consumers: LinkUp, which provides reductions in initial connection charges; and Lifeline, which provides monthly reductions in service charges. The US Department of Housing and Urban Development initiated a Neighborhood Networks program to bring Internet access to residents in low-income public housing projects. Among states, growing recognition that the wave of mergers in the telecommunications industry provides an opportunity to enhance service in low-income communities led public utilities commissions in California and Ohio to link approval of mergers to increased investments in underserviced areas.

At the local level, a growing network of neighborhood activists, community development corporations, churches, and senior citizen centers attempt to bridge the digital divide (Sawicki and Craig, 1996)—the Digital Divide Network is a clearinghouse for public institutions, private firms, and nonprofit agencies concerned with this issue (www.digitaldividenetwork.org). Organizations such as the National Education Association and the Urban League, often with corporate backing, have sponsored a "Digital War on Poverty" to facilitate Internet access in low-income minority communities in several cities. Hewlett-Packard, for example, pledged $15 million toward this end, while Gateway Corporation started a 5-year program to train 75 000 teachers in computer technology (Wax, 2000).

Concluding thoughts

Claims that access to the Internet is readily available to all, and therefore its effects cannot help but be beneficial and democratic, must be viewed with great skepticism. Technologies, including telecommunications, are never socially or spatially neutral in their impacts. There is a persistent and continuing need to link the understanding of cyberspace with very real spaces of class and power, as Poster (1989) so masterfully did in his now-classic work. All the existing social categories of wealth and power are replicated in cyberspace, at least in terms of access to the equipment and technical know-how necessary to gain entry. At the global level, the Internet is likely to reinforce or even deepen existing divisions between the 'haves' and the 'have-nots', between

the First and the Third Worlds, as much as it is likely to eliminate them, causing the global 'digerati' (Brockman, 1996) to become increasingly disconnected from the local environments of their own cities and countries. Castells likens cyberspace to Athenian democracy:

> "While a relatively small, educated, and affluent elite in a few countries and cities would have access to an extraordinary tool of information and political participation, actually enhancing citizenship, the uneducated, switched off masses of the world, and of the country, would remain excluded from the new democratic core, as were slaves and barbarians at the onset of democracy in classical Greece" (1997, page 351).

Thus, the Internet represents the Athenian vision of democracy writ large.

Rosy and premature predictions that the Internet would unleash human potential in low-income communities, level hierarchies, and blur the lines of authority have given way to more realistic assessments that point to the exacerbated social and economic tensions that accompany the diffusion of this technology in many communities, enhancing the divisions between the information 'haves' and 'have-nots'. Graham and Marvin (1996) tie this division to the increasing polarization of Western societies in general, noting the disintegration of the public sphere and the commodification of private ones. Observations that the Internet accentuates social divisions are

> "not at all surprising when they are placed against the backdrop of urban economic restructuring and the emergence of new, intensified patterns of urban poverty and social polarization. ... large cities, based, in the past, largely on face-to-face exchange in public spaces, are dissolving and fragmenting into webs of indirect, specialized relationships" (Graham and Aurigi, 1997, page 26 – 27).

Indeed, cyberspace may allow for the reconstruction of "communities without propinquity" (Doheny-Farina, 1996), or public spaces of unfettered discourse in the Habermasian sense, if neighborhoods have unrestricted and unpoliced access. In an age in which social life is not only increasingly mediated through computer networks but fundamentally altered by them, the annihilation of public spaces and their reconstruction around the increasingly commodified, privatized spaces of cyberspace has disturbing implications for those without the wealth and power to gain access to the Internet (Grossman, 1995). Participation in electronic communities reflects the social contexts that shape the adoption and diffusion of Internet technology; thus, the definition of 'access' must be broadened from simply owning a computer and logging onto the Internet to include the institutional and cultural forces that entice and encourage people to remain digitally connected. As the Internet has diffused through progressively broader tiers of Western society, albeit unequally, new users frequently resemble the general population with greater frequency; fears that the 'digital divide' will remain in perpetuity, therefore, may be exaggerated.

Lastly, it is abundantly evident that geography still matters. Access to the Internet is deeply conditioned by where one is, which is in turn a reflection of relations of wealth and power. Long-standing categories of core and periphery are all too apparent within cyberspace, such as the divisions between developed and less-developed nations, or cities and rural areas. Thus, electronic systems simultaneously reflect and transform existing topographies of class, gender, and ethnicity, creating and recreating hierarchies of places mirrored in the spatial architecture of computer networks. Far from eliminating differences among places, systems such as the Internet allow their differences to be exploited. As both a site of fixed investments and a space of flows (Castells, 1996; 1997), the Internet in an age of hypermobile capital must be judged as much in terms of equality of access as efficiency of use, by the ways in which it generates benefits to those who need it most as well as to those who use it heavily.

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