
CHAPTER 41

Toward an Environmental Psychology of the Internet

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A DEFINING FEATURE of environmental psychology relative to other areas of behavioral and environmental science is its explicit focus on human-environment transactions—the processes by which people come to understand, evaluate, modify, and respond to their everyday physical and social environments (Craig, 1973; Proshansky, Ittelson, & Rivlin, 1976). This core concern with the nature of people-environment relationships is reflected in the multiple research paradigms of the field, including studies of environmental stress, cognitive mapping, environmental assessment, human spatial behavior, resource conservation behavior, and ecological psychology, among others (Craig, 1977; Stokols, 1995). Although these research traditions emphasize different facets of human-environment transaction (e.g., environmental cognition, evaluation, and behavior), they are guided by at least two common assumptions. The first is that people's relationships with their physical and social environments are psychologically important to them and substantially influence their development and well-being (Ittelson, Proshansky, Rivlin, & Winkel, 1974). The second is that people ideally strive to optimize, or at least enhance, the degree of fit between their own (or their group's) goals and needs, on one hand, and conditions of the environment that either support or constrain those needs, on the other (Michelson, 1970; Stokols, 1978).

The premise that people's transactions with their place-based environments are psychologically important and influential was regarded as a fundamental truth among environmental psychologists

when the field coalesced during the late 1960s and was still taken for granted two decades later when the first *Handbook of Environmental Psychology* was published (Stokols & Altman, 1987). As this handbook goes to press in 2002, however, the psychological significance of people's attachments to their proximal environments has been called into question by the societal transformations that have occurred during the 14 years separating the publication of the two handbooks—especially the dramatic social and environmental changes spawned by the desktop-computing revolution of the 1980s (Kling & Iacono, 1991) and the proliferation of the Internet, World Wide Web, and related digital communications technologies (e.g. cellular phones, hand-held computers) during the 1990s (Castells, 1998; Wellman, 1999). The rapid influx of computers into people's workplaces, homes, and educational environments not only altered the physical landscape of interior environments but also made possible the establishment of high-speed digital communication networks that have substantially eased the constraints of physical distance and time on many forms of social interaction.

The research literature in environmental psychology provides ample evidence that (1) spatial proximity fosters social contacts and friendship formation (Festinger, Schachter, & Back, 1950), (2) individuals' experiences with particular places constitute an important part of their self-identity (Cooper, 1974; Proshansky, Fabian, & Kaminoff, 1983), and (3) involuntary relocation from a familiar neighborhood often provokes emotional distress

and illness symptoms among the dislocated individuals (Fried, 1963). A major question addressed in this chapter is whether or not these "foundational" findings from earlier programs of environment behavior research are generalizable to the Internet Society of the twenty-first century. Scholars from urban sociology and other fields have concluded that human communities no longer are place based but reside instead within highly personalized, digital communication networks unbounded by space and time. For instance, Wellman (in press) has written that:

Computer-supported communication will be *everywhere*, but because it is independent of place, it will be situated *nowhere*. The importance of a communication site as a meaningful place will diminish even more. The person—not the place, household, or workgroup—will become even more of an autonomous communication node. Contextual sense and lateral awareness will diminish. (p. 4)

He further states:

People usually obtain support, companionship, information, and a sense of belonging from those who do not live within the same neighborhood or even within the same metropolitan area. People maintain these community ties through phoning, writing, driving, railroading, and flying. . . . Neighborhoods are not important sources of community. They have become variably safe and salubrious milieus from which people sally forth in their cars, telephone from their kitchens, or email from their dens. (p. 7)

Certainly not all individuals or groups in North America and other regions of the world are sufficiently affluent to own computers and personal digital assistants, nor do they possess the requisite technological knowledge to establish and maintain digital communication networks (National Telecommunications and Information Administration, 2000). We discuss the implications of this "Digital Divide" later in the chapter (cf. Garces, 2000). Nonetheless, Wellman's observations about contemporary society and those of other scholars who regard the Internet as a means of promoting social support and community cohesion (cf. Cole et al., 2000; Horan, 2000; Negroponte, 1995) must be taken seriously by environment behavior researchers because their perspectives on the Internet Society offer a provocative

counterpoint to the more traditional view—predominant in environmental psychology—that people's attachments to particular places are essential to their emotional and physical well-being.

The rapid growth of the Internet, World Wide Web, and digital communications technologies over the past decade poses several challenges for future studies of human-environment transaction. First, new measures and methods must be developed for characterizing the variety of cyberspaces that now exist on the Web (e.g., Web-based chat rooms and electronic bulletin boards). For instance, the visual and interactive qualities of these virtual sites remain to be assessed not only in terms of their objective qualities (e.g., informational complexity and accuracy, multimedia components), but also for their perceived attractiveness (Nasar, 1988), legibility, imageability (cf. Downs & Stea, 1973; Lynch, 1960), and capacity to influence participants' behavior, development, and well-being (Gackenbach, 1998; Kiesler, 1997). Second, several questions concerning the impact of the Internet and Web on people's attachments to their proximal environments and their commitments to place-based relationships remain to be addressed (Stokols, 1999, in press). These research questions and challenges are likely to catalyze novel theories of environment and behavior in the coming years.

In the next section of the chapter, we examine key features of the Internet and Web and document their tremendous growth during the 1990s. We then consider certain conceptual questions posed by the rise of the Internet and sketch the broad contours of a newly emerging field, the *environmental psychology of the Internet* (cf. Stokols & Montero, 2001).

DIMENSIONS, GROWTH, AND BEHAVIORAL IMPACTS OF THE INTERNET

The Internet encompasses the vast array of electronic connections that link millions of computers and their users throughout the world. The Internet is a highly diversified technology in that it supports multiple forms of computer-mediated communication (CMC) such as electronic mail, e-mail listserves (groups of e-mail users organized around certain topics), electronic bulletin boards and newsgroups, and sites on the Web that range from noninteractive to interactive displays of textual, graphical, and auditory information and media. Among the most

interactive of these Web sites are the multiuser domains (MUDs), which offer visitors and members opportunities to enter virtual chat rooms, communicate with each other in real time, and manipulate graphical objects displayed at the site. Individuals gain access to the Internet using their desktop or hand-held computers and cable TV systems. But in contrast to TV programming, which is passively received by viewers once a particular channel is selected, the Internet offers unprecedented opportunities for interactive exploration of electronic Web sites, MUDs, bulletin boards, and data archives (Rheingold, 1993; Schuler, 1996).

Over the past decade, the Web and the Internet have grown exponentially. According to a recent survey of Web usage, the number of recorded sites on the Web grew from 10,022 in December 1993 to 109,574,429 in January 2001 (Internet Software Consortium, 2001). An independent report on *The State of the Internet 2000* estimated that, in 1993, fewer than 90,000 people worldwide used the Internet on a regular basis, but by summer 2000, the number of regular Internet users had expanded to more than 300 million people worldwide—a 3,000-fold increase in the online population (International Technology and Trade Associates [ITTA], 2000). And by the year 2005, the number of Internet users worldwide is expected to surpass the 1 billion mark. The rapid growth of the Internet during the 1990s has dramatically altered the ways in which people live and work. For instance, the increasing prevalence of desktop computing and access to the Web have made telecommuting and home-based work more feasible for large segments of the population (International Telework Association and Council, 2001). Also, the development of instantaneous interactive communications via the Internet, incorporating multiple media such as text, graphics, video, and audio, have given computer users much greater access to geographically distant people and places than ever before (Mitchell, 1995; Negroponte, 1995).

THEORETICAL QUESTIONS CONCERNING ENVIRONMENT AND BEHAVIOR IN THE AGE OF THE INTERNET

The capacity of the Internet to bring geographically distant information sources and electronically simulated “virtual” places to one’s computer or TV screen raises several intriguing questions about the

changing ecology of human-environment transactions. Some of these questions pertain, for example, to: (1) the relative influence of “proximal” versus “distal” processes on individuals’ behavior, development, and well-being; (2) the bivalent nature of the Internet—that is, its capacity to enhance or impair individuals’ development and well-being and to strengthen or weaken people’s attachments to their proximal environments; and (3) the behavioral and health implications of the Internet’s exponential growth in light of humans’ limited capacities for coping with information overload and accelerating rates of environmental change (cf. Cohen, 1980; Emery & Trist, 1972; Lyman & Varian, 2000).

Research in environmental psychology has focused largely on the conditions in one’s immediate environment that influence his or her behavior and well-being. This explicit focus on the behavioral influence of the proximal environment is rooted in Lewin’s (1936) conceptualization of the *psychological lifespace*—the totality of psychobiological conditions (e.g., perceptions, motivations, and salient features of the environment) that determine one’s behavior at a specific moment within a particular place. Lewin referred to the nonsalient (nonperceived) features of the sociophysical environment as the “foreign hull” of the lifespace—those contextual circumstances located beyond the boundaries of the lifespace that, according to Lewin, are more amenable to sociological and biophysical studies than to psychological research.

Prior to the Internet’s emergence as a powerful and pervasive force in society, the perceptual salience and behavioral influence of environmental conditions were generally correlated with their geographic proximity and immediacy to the individual. With the advent of the Internet and Web, however, individuals’ opportunities to experience distant places and events are now much less bounded by spatial and temporal constraints. Whereas non-Internet forms of communication (e.g., reading a book, watching TV, talking with others on the telephone, or corresponding with them by surface or air mail) can bring geographically distant people and places psychologically closer to the individual, the Internet differs from these other media in some important respects. First, electronic mail and the Web make it possible for an individual to communicate simultaneously and interactively with scores, and even hundreds, of other persons—for example, through “instant messaging” among acquaintances

that find themselves online at the same time. By contrast, TV programs are experienced more passively than interactively, and telephone conversations are usually restricted to dyads (or to slightly larger groups participating in "conference calls").

In addition to affording simultaneous contact with a large number of other people, Internet-based communications often combine textual, graphic, and auditory modalities (e.g., real-time video images of the people one is communicating with as well as dynamic views of their physical surroundings). Printed media are quite capable of depicting faraway people and places through photographs, drawings, and text, but they do not provide real-time interactive views of distant people and events; nor can they deliver nearly instantaneous, multimodal communications as exemplified by electronic mailings that contain document, voice, and video attachments. The Internet and Web also afford serendipitous encounters with large numbers of strangers in cyberspace and opportunities to explore hundreds and even thousands of communication channels (or Web sites) within relatively short intervals of time.

The capacity of the Internet to make remote places and events psychologically salient to those who use this new technology has important psychological consequences across the lifespan. On the positive side, young children and adolescents with regular access to the Web are likely to be exposed to diverse cultural influences and vast stores of information, thereby broadening their understanding of the world and strengthening their sense of connection with remote people and places. Similarly, working adults can use the Internet to expand their personal skills and knowledge so that they are better equipped to perform effectively in their jobs. And older adults can now use the Internet to maintain a proactive orientation toward other people and places, strengthen their ties to the outside world, and counter feelings of loneliness and isolation even as their physical mobility becomes more constrained with the passage of time (Lawton, 1999; Rook, 1984; SeniorsCan Internet Program, 2001; SeniorNet, 2001). Also, online communication networks can be used to reinforce social support and a sense of community among the members of place-based organizations, neighborhoods, and towns (Blanchard & Horan, 1998; Blumenstyk, 1997; Horan, 2000).

At the same time, however, the Internet can exert a profoundly negative, albeit indirect, influence on the development and well-being of individuals and

groups who are least likely to use it. Several demographic studies have shown that low levels of education and income make it much less likely for individuals to own computers and to have access to the Internet (Garces, 2000; NTIA, 2000). Moreover, certain regions of the world lack the requisite infrastructure (e.g., telephone lines and digital communications technologies) for residents to participate in the Internet and Web. Castells (1998) has referred to these regions as the *Fourth World*—a series of "black holes of informational capitalism" that have been cut off from the flow of information in the global economy. In light of these demographic trends, it is important to address the psychological and developmental consequences of the Internet and Web for those individuals who find themselves on the wrong side of the Digital Divide because of low socioeconomic status and/or electronic isolation. For younger individuals, developmental deficits among those living in poverty may become more severe as the Internet widens the rift between information-rich and information-poor segments of the world's population. At the same time, Internet-deprived older adults may find themselves caught in a spiral of increasing poverty caused by their restricted access to job opportunities that require training in information technology (cf. Freeman & Aspray, 1999). If these developmental deficits among individuals who lack access to information technology are not redressed, they are likely to provoke increasing conflict and destabilization among the developed and underdeveloped countries of the world (cf. Castells, 1998).

Even among more affluent members of society who have ready access to the Internet and Web, increased use of digital communications technologies can be a source of negative behavioral, developmental, and health outcomes. For instance, parents' frequent use of home-based computers may interfere with developmental processes by constraining opportunities for parent-child interaction, thereby promoting an ambiance of nonresponsiveness in family environments (Stokols, 1999; Wachs & Gruen, 1982). Also, the Internet and Web have created new opportunities for engaging in criminal activities online such as "cyber stalking," child sexual abuse, identity theft, and financial fraud and for promoting racism and hate crimes (Hayes & Boucher, 1997; Mannix, 2000). And, aside from these criminal abuses, individuals' growing use of digital communications technologies has been linked in some studies to

higher levels of self-reported loneliness, reduced social contact with family members and friends, and experiences of chronic distraction, overload, and stress resulting from a surfeit of electronic communications (cf. Kraut et al., 1998; Milgram, 1970; Nie & Erbring, 2000). Considering these potentially negative consequences of society's growing reliance on digital communications, an important challenge for future theory development and research is to specify the contextual circumstances under which people's use of the Internet and Web has the most positive and least detrimental effects on psychological, behavioral, and health outcomes.

The theories, methods, and findings from environment behavior studies offer a valuable but relatively untapped perspective from which to approach the theoretical questions and research challenges outlined above. Earlier research on the psychological and social consequences of the Internet have focused primarily on intrapersonal and interpersonal processes and outcomes while giving less attention to the ways in which the Internet is transforming people's day-to-day transactions with their place-based physical and social milieus (Gackenbach, 1998; Kiesler & Kraut, 1999; McKenna & Bargh, 2000; Turkle, 1995). In the remaining portions of the chapter, we examine these issues from the perspective of environmental and ecological psychology to better understand how society's growing reliance on digital communications has altered and will continue to transform people's encounters with their sociophysical surroundings (Barker, 1968; Bechtel, 1997; Bell, Fisher, Baum, & Greene, 1990; Michelson, 1970; Proshansky et al., 1976).

THE CHANGING ECOLOGY OF HUMAN-ENVIRONMENT RELATIONS IN THE INTERNET ERA: ENVIRONMENTAL PSYCHOLOGY AS A FOUNDATION FOR THEORY DEVELOPMENT AND RESEARCH

Environmental psychology emerged as an organized area of interdisciplinary scientific inquiry during the late 1960s and early seventies (cf. Bronfenbrenner, 1977; Craik, 1973; Ittelson et al., 1974; Moos, 1976). The emergence and rapid expansion of this field was attributable in part to growing societal concerns about environmental pollution, adverse global environmental

changes, and the behavioral consequences of overcrowding (Carson, 1962; Ehrlich, 1968; Kates & Wohlwill, 1966). At the same time, concerted efforts by many researchers to address conceptual gaps in psychological science (especially those concerning the behavioral and health impacts of the large-scale environment) further contributed to the burgeoning growth of environmental psychology and social ecology. The historical evolution and substantive concerns of environmental psychology are well covered in other chapters of this volume, so we provide only a brief and general overview of these developments.

By the late 1970s, the field of environmental psychology consisted of multiple scientific paradigms (Craik, 1977), each organized around a particular facet of human-environment transaction (e.g., environmental cognition, spatial behavior, environmental stress, ecological psychology, environmental attitudes and assessment, experimental analyses of environmentally protective behavior). Some of these research areas emphasized people's active efforts to interpret and restructure their surroundings (e.g., environmental cognition and spatial behavior), whereas others reflected a more reactive stance toward the environment (e.g., environmental assessment, health effects of urban stressors). In an effort to integrate these distinct research paradigms and explain how individuals use different modes of relating to their environments in a sequential, organized fashion, environmental psychologists drew heavily on the principles of ecology and open systems theory (cf. Stokols, 1977).

Ecological theories were first developed by biologists working during the late 1800s (Clements, 1905; Darwin, 1859/1964; Warming, 1909) and later elaborated by psychologists and sociologists in their analyses of human response to urban environments (Alihan, 1938; Hawley, 1950; Park, Burgess, & McKenzie, 1925). Ecological psychologists, for example, conceptualized behavior settings as systemically organized, place-based units of people-environment transaction (Barker & Schoggen, 1973; Wicker, 1979). Other theorists focused on the "ecology of human development" and documented the ways in which individuals' multiple life settings (e.g., residential, day care, work environments, public spaces), spanning micro-, meso-, and macrolevels, jointly influence their psychosocial development over the life course (Bronfenbrenner, 1979; Friedman & Wachs, 1999).

Central to ecological analyses of environment and behavior are certain basic assumptions and principles

derived from open systems theory (Emery, 1969; Katz & Kahn, 1966; von Bertalanffy, 1950). A core assumption of systems theory is that people strive to achieve equilibrium or homeostasis with their physical and social milieu (Altman, 1975; Barker, 1968; Emery & Trist, 1972; Moos, 1976). Some theorists referred to this state of balance as person environment (PE) "congruence" or "fit" (Michelson, 1970; Wicker, 1972). They also noted that when levels of PE fit are perceived by an individual to be inadequate, that person is more likely to experience symptoms of emotional and physiological stress than when conditions of fit are viewed as more favorable (Michelson, 1985).

Another principle of ecological systems theory suggests that people's relationships with their surroundings are goal directed and reflect reciprocal phases of influence between individuals and their environments. For example, Stokols (1978) proposed that the multiple paradigms of environmental psychology correspond to different facets or phases of *human-environment optimization*, a dynamic and sequential process by which individuals strive to achieve "optimal environments"—those that maximize the fulfillment of their needs and the accomplishment of their goals and plans. In many situations, people are forced by situational constraints to accept undesirable environmental conditions, or at best to "satisfice" (Simon, 1957)—that is, achieve less than optimal improvements in their surroundings. Stokols notes: "Although environmental optimization is never realized in its ideal form, the concept is heuristically useful in emphasizing the goal-directed and cyclical nature of human-environment transactions and in suggesting certain processes by which these transactions occur" (p. 258). These fundamental processes of person environment transaction include the *interpretive*, *evaluative*, *operative*, and *responsive* modes of dealing with one's surroundings.

The assumptions of systems theory and the research foci of environmental and ecological psychology provide a useful starting point for considering the transformative impacts of the Internet and Web on the quality of people's lives and the patterning of their routine activities and projects. The cumulative evidence from several programs of environment behavior research suggests that humans strive (1) to establish and maintain meaningful psychological and social connections with the material world, reflected in their strong emotional attachments to

particular objects and places; and (2) to optimize the degree of fit between their personal and collective needs for identity, affiliation, social support, emotional and physical security, and environmental legibility, on the one hand, and conditions present in the physical and social environment that, ideally, facilitate the fulfillment of those needs, on the other. Moreover, (3) individuals are most likely to experience psychological, social, and physiological stress when levels of person environment fit are perceived to be low (e.g., conditions of prolonged stimulation overload; infringements on one's privacy in residential, work, or institutional settings; lack of access to aesthetic surroundings and natural environments). The evidence supporting these propositions is consistently strong across several paradigms of environment behavior research. The field of environmental and ecological psychology thus provides a useful backdrop for developing a conceptual analysis and programmatic agenda for future research on the ways in which the Internet and Web are transforming the quality and structure of people-environment transactions. These issues are addressed below.

A CONCEPTUAL FRAMEWORK AND AGENDA FOR FUTURE RESEARCH

A conceptual framework for future research on the environmental psychology of the Internet is outlined in Table 41.1, adapted from (Stokols, 1978). As in the earlier version of this table, four basic modes of person environment transaction are shown along with key paradigms of environment behavior representing each mode. Under the active-cognitive or *interpretive* mode, for example, the paradigms of environmental cognition and personality and the environment are listed. Within the lower right cell, denoting the reactive-cognitive or *evaluative* mode, research on environmental attitudes and people's evaluative assessments of particular places are included. In the upper right cell of the table, representing the active-behavioral or *operative* mode, research on how people use the spatial environment to regulate privacy and other aspects of interpersonal relations (e.g., processes of personal space regulation, territoriality) and on their environmentally-protective behavior (e.g., processes of resource conservation, recycling) are listed. Finally, in the lower right cell, depicting the reactive-behavioral or *responsive* mode, research on people's reactions to

Table 41.1
Influence of the Internet on Four Modes of Human-Environment Transaction:
Questions for Theory Development and Research

		Form of Transaction	
		Cognitive*	Behavioral
Phase of Transaction	Active	<i>Interpretive Mode</i> Environmental Cognition Will frequent exposure to computer-simulated environments on the Web reduce individuals' sense of environmental coherence and legibility?	<i>Operative Mode</i> Human Spatial Behavior Is spatial proximity being replaced by electronic connectivity as a requisite for social contact and friendship formation?
		Personality and Environment Do certain dispositions (e.g., sensation seeking) enable individuals to retain a stronger sense of environmental coherence following exposure to multiple simulated environments on the Web?	Environmentally Protective Behavior Can future efforts to promote environmental conservation be made more effective through the use of informative Web sites that convey futuristic scenarios of environmental degradation?
	Reactive	<i>Evaluative Mode</i> Environmental Attitudes Do short-term encounters with virtual places on the Web lead to incomplete or biased appraisals of those environments?	<i>Responsive Mode</i> Environmental Stress How will individuals' exposure to increasing digital communications affect their susceptibility to chronic stress and related health problems?
		Environmental Assessment Will greater access to simulated views of remote places weaken people's attachments to their proximal environments and relationships?	Ecological Psychology How might the potential conflicts between virtual behavior settings and the real environments from which they are accessed be minimized or avoided?

Source: Adapted from Stokols, 1978.

*In this framework, the term cognitive refers to both informational and affective processes.

environmental stressors (e.g., high density, noise, traffic congestion) and to conditions of under- and overstaffing in their everyday behavior settings (the ecological psychology paradigm), are shown.

The conceptual framework presented in Table 41.1 extends Stokols's (1978) representation of research paradigms in environmental psychology by incorporating a series of questions about changes in the nature of people-environment relations that may be occurring due to the rapid growth of the Internet and Web. These questions offer a useful starting point for future theory development and research on the environmental psychology of the Internet. In the following sections of the paper,

we consider new directions for Internet-related research as they pertain to each of the four basic modes of people-environment transaction described earlier.

INFLUENCE OF THE INTERNET ON PEOPLE'S INTERPRETATION OF THEIR SURROUNDINGS

Research on environmental cognition examines the ways in which individuals develop mental representations of their sociophysical environments (Lynch, 1960; Milgram & Jodelet, 1976). For example, studies of cognitive mapping processes in humans have examined prominent physical features and social

meanings of urban environments that promote high levels of *imageability*, or the capacity of a place to evoke strong and memorable mental images. Another core construct in this research area is environmental *legibility*, or the extent to which the layout and organization of places are perceived to be coherent and understandable by occupants.

The rapid growth of the Internet and Web poses several new questions for future research on environmental cognition. First, access to the Internet offers individuals unprecedented opportunities for visiting digitally simulated environments via their computers—for example, art museums, concert halls, and cultural centers—many of which are located in faraway places. This enables computer users to acquire detailed previews and greater knowledge about unfamiliar places before they actually visit them. At the same time, however, greater opportunities to encounter places virtually through computer-based digital photos and video simulations might hasten the pace but reduce the coherence of people's environmental experiences. Earlier studies suggest that humans have an intrinsic need to experience their physical and social environments kinesthetically—that is, through direct encounters with places that are associated with multiple tactile, olfactory, visual, and auditory cues (Hall, 1966). As the proportion of individuals' environmental experiences shifts from direct, kinesthetic encounters with places toward increasingly simulated and fragmented views of those settings, how will their sense of coherence and legibility be affected? Several lines of research suggest that humans strive to maintain a strong sense of environmental coherence (Antonovsky, 1981; Kaplan & Kaplan, 1989). Extrapolating from these studies, it seems plausible that individuals' exposure to an increasingly rapid and diverse array of simulated environments on the Internet may place considerable strain on their capacity to achieve a coherent understanding of their surroundings.

Research within the personality paradigm of environmental psychology (Craig, 1976; Little, 1987) further suggests that individuals may vary widely in their preferences for exposure to multiple, digitally simulated environments on the Internet, and their capacities to cultivate and retain a sense of coherence in the face of rapid computer-mediated experiences of diverse places. For example, individuals scoring high on the Sensation-Seeking Scale (Zuckerman, 1979) may prefer higher levels of exposure to multiple simulated environments on the Web and

experience less mental fatigue and loss of perceived environmental coherence than those who score low on the sensation-seeking dimension (Smith, Johnson, & Sarason, 1978).

Several other questions concerning environmental cognition and legibility are raised by the advent of the Internet and Web. For instance, do the graphic designs and visual qualities of some Web sites evoke stronger images and memories than others, thereby prompting visitors to return more frequently to those sites? Also, do computer-simulated previews of unfamiliar places enable individuals to acquire more legible mental maps and a stronger sense of coherence once they actually visit those places than would be possible without the benefit of these digital previews? In this regard, prior studies suggest that the psychological and health benefits of virtual visits to unfamiliar places may be especially evident among frail elderly persons who must relocate from their private residence to an institutional care facility (Pastalan, 1983).

INFLUENCE OF THE INTERNET ON PEOPLE'S EVALUATIONS OF THEIR SURROUNDINGS

The environmental attitudes and environmental assessment paradigms are centrally concerned with the ways in which people evaluate their surroundings (Craig & Feimer, 1987). Whereas environmental attitudes reflect an individual's tendency to respond either positively or negatively to a particular place, environmental assessments can entail collective as well as individual judgments about previously or currently occupied environments. Also, many environmental assessment projects are undertaken to reveal people's preferences or concerns about future environments that they have not yet encountered (e.g., a design committee's review of site plans for a future neighborhood recreation center).

The fact that the Internet and Web afford computer users greater opportunities to visit multiple remote environments virtually rather than directly raises important questions about environmental evaluation processes. First, because computer-mediated encounters with places are often of short duration and emphasize highly selective visual information about those settings, the virtual visitor is deprived of the opportunity to experience the place in a more complete and sustained fashion. Do these ephemeral encounters with virtual places lead to incomplete (e.g., visually dominated) and biased appraisals of

the actual places that are simulated on the Web? In some instances, digital simulation may make remote environments appear more attractive and desirable than they actually are. Consequently, greater opportunities to make virtual visits to a broad range of remote locations might artificially inflate a visitor's "comparison level for alternatives" (Thibaut & Kelley, 1959), thereby weakening his or her attachment to a presently occupied environment. Might this grass-is-always-greener phenomenon, piqued by frequent exposure to simulated environments on the Web, weaken people's affective ties to their immediate surroundings and prompt faulty decision-making about potential relocation opportunities? Or, more generally, contribute to a weakened "sense of place" and an erosion of "place identity" among community members (Meyrowitz, 1985; Proshansky et al., 1983)?

Another set of Internet-relevant questions pertains to the ways in which people experience aesthetic stimuli in their physical and social environments. The Internet and Web make it possible for people to view a painting or listen to a concert through computer-based video and audio simulations. However, the social contacts that occur when a person visits a local art museum or attends a musical performance in person are lost when she or he experiences those stimuli and events in digitized form (Stokols, in press). The face-to-face social context of individuals' aesthetic experiences not only enriches their appreciation of the focal stimuli but also may play an important role in fostering stronger social ties among community members for the betterment of each individual—as associations sometimes referred to as "social capital" (Putnam, 1995). These Internet-related research issues concerning environmental evaluation processes take on even greater significance when viewed from the vantage point of prior studies highlighting individuals' needs for strong and stable ties to their everyday environments (cf. Firey, 1945; Fried, 1963; Rochberg-Halton & Csikszentmihalyi, 1981).

INFLUENCE OF THE INTERNET ON SPATIAL BEHAVIOR AND ENVIRONMENTAL PROTECTION EFFORTS

The operative mode of human-environment transaction encompasses the myriad ways in which people actively modify their physical and social surroundings. Building a home, decorating one's office, and participating in a neighborhood recycling program exemplify behaviors that directly alter the structure or quality of a particular environment. Two

paradigms of environmental psychology that emphasize individuals' behavioral modifications of their surroundings are *proxemics*—the study of how people use space in social situations (Altman, 1975; Sommer, 1969)—and analyses of environmentally protective (or destructive) behavior, including studies of energy conservation, waste recycling efforts, and the defacement of environments through littering and graffiti (Geller, Winett, & Everett, 1982; Os-kamp, 2000).

Earlier studies of spatial behavior have examined how people regulate their interaction distances (or personal space) with others through both verbal and nonverbal behaviors and how they establish territorial boundaries within the context of specific place-based settings. For example, Altman's model of spatial behavior emphasizes the ways in which individuals adjust personal space and territorial boundaries to achieve desired levels of privacy with co-occupants of particular settings (Altman, 1975). To the extent that desired privacy levels are achieved, the individual is able to avoid stressful experiences such as social isolation at one extreme and perceived crowding at the other.

The central role of spatial and temporal proximity in interpersonal relationships is underscored by field studies documenting the strong influence of door-to-door proximity among neighbors on the development of local friendship networks and patterns of political and consumer behavior (Festinger et al., 1950). With the advent of the Internet and Web, however, the constraining influence of spatial and temporal proximity on informal social interaction, privacy regulation, and friendship formation has been diminished by the availability of electronic networks (e.g., e-mail listserves, Web-based chat rooms) that facilitate frequent communication among participants located in geographically distant areas. Thus, it appears that physical proximity is gradually being replaced, or at least supplemented, by electronic connectivity as a requirement for interpersonal contact and as a basis for managing privacy and communicating both personal and collective identities (Kiesler, 1997; Turkle, 1995).

Some researchers contend that people's diminishing reliance on place-based, face-to-face encounters with others and on geographically anchored centers of higher education, health care delivery, and political engagement eventually will weaken the social fabric of communities, resulting in greater loneliness and reduced social support

(Kiesler & Kraut, 1999; Meyrowitz, 1985; Noam, 1995). By contrast, others argue that individuals are effectively using their electronic networks to develop and maintain strong interpersonal and professional affiliations (Cole et al., 2000; Horan, 2000; Wellman, 1999). Rather than using spatial proximity as a basis for meeting others, individuals with regular access to the Internet are now establishing *virtual communities* for purposes of finding companions who share common professional, recreational, or health-related interests. According to (Blanchard & Horan, 1998), "virtual communities of interest" are comprised of geographically dispersed individuals who come together on the Internet to share information, ideas, and emotional support. "Place-based virtual communities," on the other hand, are established by participants working or residing in the same location to reinforce their face-to-face interactions. The Blacksburg Electronic Village (BEV) exemplifies a place-based virtual community that was established to enhance residents' sense of community and civic engagement in Blacksburg, Virginia (Cohill & Kavanaugh, 2000).

The rise of the Internet and Web also poses important questions for future studies of environmentally protective behavior. In the past, efforts to promote energy conservation and the recycling of waste products have relied heavily on community-based information campaigns and household-specific customer feedback and monetary incentive programs organized by local utility companies (Bator & Cialdini, 2000; Geller et al., 1982). However, future efforts to promote environmental conservation and reverse adverse global environmental changes are likely to be channeled through comprehensive, authoritative, and visually striking Web sites that convey futuristic scenarios of environmental degradation and offer visitors extensive information about ways to curb energy consumption, global warming, and ozone depletion and enhance biodiversity (International Council for Science, 2001; United States Environmental Protection Agency, 2001a, 2001b).

IMPACT OF THE INTERNET ON ENVIRONMENTAL STRESS AND BEHAVIOR SETTING PROCESSES

The responsive mode of human-environment transaction pertains to individuals' behavioral and physical responses to environmental conditions. Two research paradigms that reflect a strong emphasis on the responsive mode include studies of human response to environmental stressors, such as high

density noise, traffic congestion, and uncomfortable climate (Evans, 1982; Glass & Singer, 1972; Milgram, 1970), and ecological psychology, which has documented the influence of organizational conditions such as under- and overstaffing in behavior settings on their participants (Barker, 1968; Bechtel, 1997; Schoggen, 1989; Wicker, 1979).

The term *stress* denotes an imbalance between the environmental demands confronted by an individual and his or her capacity to cope with those demands (Selye, 1956). The construct *psychological stress* refers to an imbalance between one's *perception of environmental demands* and her or his *perceived ability to cope* with those conditions (Lazarus, 1966). Residents of large cities, for example, are prone to experiencing "urban overload," a form of stress that occurs when the quantity and rate of environmental stimuli exceed an individual's ability to process and cope with them (Milgram, 1970).

Research on environmental stress offers a useful backdrop for considering the potential behavioral and health impacts of information overload resulting from a surfeit of digital communications. The *State of the Internet 2000* report, mentioned earlier, chronicles the dramatic growth of the online population worldwide during the 1990s (ITTA, 2000). The exponential rise in Internet use and digital communications also is reflected in a study conducted by America Online, Inc., which found that e-mail usage per AOL subscriber increased by 60% over the past year, while AOL's total e-mail usage increased 120% during the same period (Messaging Online, Inc., 2000). Moreover, a report released by the University of California, Berkeley, School of Information Management and Systems estimated that, although it has taken 300,000 years for humans to accumulate 12 "exabytes" (i.e., one billion gigabytes) of information, it will take only 2.5 more years to create the next 12 exabytes (Lyman & Varian, 2000).

These trends in Internet use and information production suggest that individuals' information-processing capacities will continue to be taxed in the coming years by their exposure to an onslaught of digital communications transmitted via desktop and laptop computers, hand-held digital devices, mobile cellular phones, and fax machines. Not only will the quantity of communications increase, but also the variety of settings and time periods in which individuals can be contacted digitally by friends, work associates, and strangers. Widespread use of the Internet and Web has promoted a syndrome of being "always online" among regular computer users who,

in effect, remain "tethered" to multiple electronic devices—not only while occupying traditional work environments but also while in residential and recreational settings—except when they are sleeping or choose to go "offline" (Guzzetta, 2001).

Confronted by an ever expanding flow of information sent via multiple communication channels and received at several locations throughout the day, computer users' vulnerability to attentional overload and stress is likely to increase in the coming years. Prior studies indicate that chronic stress can undermine people's resistance to disease and behavioral functioning across diverse settings (Cohen, 1980; Cohen & Williamson, 1991). To meet the performance and health challenges posed by a proliferation of digital communications, individuals and groups must develop improved strategies for filtering, sorting, prioritizing, and storing information. Some of these coping strategies will be facilitated by technological advances (e.g., the message-filtering capabilities of advanced e-mail systems). But perhaps the most effective strategies for managing information overload will not be technological in nature but depend instead on the ability of individuals to spend portions of their time offline in *restorative environments* (Kaplan & Kaplan, 1989)—those that enable them to escape from their usual activity routines and afford ample opportunities to engage in spontaneous or nondirected attention—for example, in natural environments that are both beautiful and tranquil (Korpela & Hartig, 1996; Ulrich, 1983). Restorative settings are defined by their capacity to promote relaxation and alleviate stress.

Research in the area of ecological psychology suggests additional ways in which the structure of place-based behavior settings can either enhance or undermine individuals' ability to cope with an increasing deluge of computer-mediated information. The basic unit of analysis in ecological psychology is the *behavior setting*, a physical location in which the members of a particular group come together to perform a program of activities on a recurring basis (Barker, 1968). Examples of behavior settings include offices, homes, or the regularly scheduled practices of a basketball team that take place in a high school gymnasium.

In recent years, Barker's conceptualization of place-based behavior settings has been extended to account for people's growing participation in *virtual behavior settings*, or electronic sites on the Internet created through the shared interactions of members that develop a symbolic sense of space or place

through sustained computer-mediated communications among participants (Blanchard, 1997). Examples of virtual behavior settings include chat rooms and multiuser domains (MUDs) on the Web. An important topic for future research concerns the ways in which individuals' participation in virtual behavior settings either complements or conflicts with the behavioral program of the place-based environment (e.g., a home or workplace) in which their computer is located and from which they access multiple Web sites. Because people's experiences of virtual settings are essentially "nested" in physically situated host environments, a new type of mesosystem (i.e., linkage between two or more settings; Bronfenbrenner, 1979) has been posited: the *r-v mesosystem* unit comprised of a *real* (place-based) host environment and a *virtual* behavior setting nested within it (Stokols, 1999).

In some cases, an individual's participation in a virtual setting conflicts with the norms and activities of the host setting—for example, when an office worker engages in recreational Web surfing on the job, thereby arousing the resentment of coworkers and supervisors. In other instances, the relationship between a virtual setting and the host environment is complementary—for instance, an educational environment where the instructor encourages students to visit course-related Web sites using computers located in the classroom for purposes of supplementing the material covered in the instructor's lectures. The potential conflicts that can occur between the behavioral programs of virtual settings and their host environments constitute an additional source of attentional overload and interpersonal stress during the Internet era. These considerations suggest that the design of future behavior settings and communities should be guided by the goal of optimizing rather than compromising the complementarity or fit between virtual and real settings—especially considering that individuals participate in both types of settings simultaneously.

SUMMARY AND CONCLUSIONS

This chapter examined the impacts of the Internet and Web on people's relationships with their physical and social environments. Several theoretical questions posed by the increasing prevalence of digital communications in society were considered. For instance, will individuals' participation in the Internet weaken their emotional attachments to proximal

environments and relationships? To what extent will individuals' personal and collective identities become less dependent on their involvement with particular places (cf. Firey, 1945; Proshansky, 1978) and more closely associated with their electronic networks or virtual communities of interest (Blanchard & Horan, 1998; Wellman, in press)? How will individuals' simultaneous participation in real and virtual behavior settings influence their vulnerability to distraction and interpersonal conflict? And how will the expanding flow of digital communications affect individuals' susceptibility to chronic overload, psychological stress, and health problems?

These and related questions were considered from the perspectives of environmental and ecological psychology. Several theories, methods, and findings from multiple paradigms of environment behavior research provided a useful starting point for considering potential impacts of the Internet and Web on human-environment transactions. A conceptual framework and research agenda were proposed as the basis for establishing a new research domain, the *environmental psychology of the Internet*. Several topics for future investigation were discussed, including the influence of computer-mediated communications and social contacts on the strength of people's emotional ties to particular geographic locations, the role of personal dispositions in mediating the psychological and social consequences of individuals' participation in the Internet and Web, and the social and health impacts of individuals' simultaneous participation in noncomplementary real and virtual behavior settings.

The primary focus of this chapter was on theoretical rather than methodological issues. Yet, several methodological challenges remain to be addressed in future research, including (1) the combined use of multiple methodologies (e.g., time budget analyses, physical trace measures, retrospective interviews) to assess individuals' time allocation to both real and virtual settings; (2) development of criteria for assessing the perceived legibility, imageability, and aesthetic value of cyberenvironments on the Web; (3) creation of measures for gauging an individual's cumulative exposure to digital information and communications over a specified time interval and the effects of that exposure on his or her well-being; and (4) development of criteria for identifying complementary or conflicting relationships between the real and virtual settings comprising a person's meso- or exosystems. Taken together, these

conceptual and methodological issues raise several provocative questions about the changing ecology of human-environment relations in the Age of the Internet and offer an exciting agenda for future research.

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