

Space-Shaping Technologies and the Geographical Disembedding of Place

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1. Introduction: The Geographical Disembedding Thesis

Places are not what they used to be. Rapid transportation systems have shrunk the distance between places, transforming them from isolated spots to junctions in the global village. Electric media like telephony allow places to blend into each other, making it possible to be closer to someone thousands of miles away than to a person in the next room. Computer networks have generated new places in cyberspace, that are frequented and inhabited like physical places. All this has dramatically altered the nature of places, as well as our sense of place. Or so I will argue.

Specifically, I will defend the thesis that over the past two centuries, the role of geographical features in the constitution of the identity of places has decreased; this devaluation has resulted from the employment of various space-shaping technologies, used by human beings to transcend the limitations of their local environments. I call this thesis the *geographical disembedding thesis*: places have become geographically disembedded, that is, they are less and less determined and defined by physical-geographical features. This thesis will be explained and defended in this essay, and it will be discussed how this process of geographical disembedding has impacted the identity of places, and even our very concept of place.

The structure of the remainder of the paper is as follows. In the next section, I will further expound the geographical disembedding thesis, focusing on key concepts like place, geographical disembedding and space shaping. In sections three to six, four geographical disembedding processes will be discussed along with the space-shaping technologies that sustain them. They are time-space compression,

time-space distancing, space blending, and space generation. Each section will describe one such process, the technologies that sustain it, and its role in the geographical disembedding of place. It will also be analyzed how these four processes cohere. In a concluding section, I will discuss how the geographical disembedding of place that results from these processes is transforming place identities, and even our very conception of place.

2. Conceptual Preliminaries: Place, Geographical Disembedding, Space Shaping

This essay is concerned with the changing identity of places. But what do I mean by 'place'? To begin, I of course mean 'geographical place,' that is, a part of a geographical region. But then there are many conceptions of geographical place. Place is sometimes defined objectively, as a mere location in physical space. Many, however, have emphasized the importance of human activity and human conception in the definition of place. David Seamon has argued that places should be understood as human constructs that arise out of routine physical interactions with the environment.ⁱ Yi-Fu Tuan has described place as 'an organized world of meaning' that emerges out of human interpretation and valuation of space: 'What begins as undifferentiated space becomes place as we get to know it better and endow it with value.'ⁱⁱ David Canter has proposed that places are the product of physical attributes, activities, and conceptions, and that any definition of place should refer to these three ingredients.ⁱⁱⁱ

Taking the suggestions of these authors into account, I will define place as *an area or space that is a habitual site of human activity and/or is conceived of in this way by communities or individuals*. This definition includes many spaces identified intuitively as human places, such as cities and villages, farms and beaches, market places and graveyards, favorite nature spots and cross-roads, homes and drilling platforms, as well as smaller places like living rooms and reading corners. In this essay, the places I have in mind will usually be larger places that are sites of social life, such as cities and office buildings, or what have been called 'locales,' the places of operation of collectives.

Turning now to the notion of geographical disembedding, this notion is intended to denote *the decreasing importance of geographical features of places, both their internal geographical features and their geographical location in physical space, as important aspects of their identity*. The identity of a place, its *place identity*, can be understood as those features that constitute a place as a meaningful site of human activity, and that

situate it relative to other places and locations. Traditionally, geographical features of places have played a strong role in their identity, and they still do. For example, the identity of a city like San Francisco is determined in large part by its physical layout, its characteristic buildings, its being located in a hilly terrain, its location near a large bay, and its location on the west coast of the United States. However, I will argue that in many places, understood as sites of human activity, such geographical markers are increasingly superseded by other identity markers. This is because place identity is to a large extent determined by the significance of a place for human activity, and geographical markers are becoming less influential as determining factors of the significance for human activity of a place.

By the significance of a place for human activity, I mean two things: (i) the kinds of activities that it enables, as determined in large part by the kinds of objects and structures available in it, and (ii) its nearness to other places and spaces that contain different opportunities for human activity. The kinds of activities that a place enables are determined in large part by the *goods*, or amenities, that a place offers. I intend to use the term 'good' in its broadest possible sense, to include any structure, object, person, or event that affords certain human activities or experiences. Example of goods are buildings, foods, services, information, vistas, festivals, social communities, weather, and local customs. The significance of a place for human activity, as defined by the goods it contains and its nearness to other places, largely defines its identity. By illustration, a village with no drinking water for which the next well is twenty miles away will acquire a different place identity than a village that has a well nearby or within its confines. Similarly, the place identity of a town square would be significantly altered by the addition of an information booth or a number of benches, as it would support different kinds of activity and afford different experiences.

The geographical disembedding thesis can now be reformulated to say that both the nature of the goods found in a particular place and its nearness to other places with different goods are less and less determined by its geographical features alone. This transcendence of geographical constraints is the result of a continual historical effort by human beings to overcome the limitations imposed by their physical environments. Historically, they have been two means by which human beings have pursued such transcendence. A first route has been *local development*, the modification and enhancement of local geographical elements: plowing the land, building homes, constructing a well, installing airconditioning. Such development makes human activity less dependent on geographical contingencies of places. For

example, air conditioning makes it possible to regulate temperature, and therefore to break free from the temperature contingencies of a particular geographical place.

A second route has been *connectivity development*, being the construction of more and better linkages between places, so that (i) goods from other places can become more quickly and easily available in a place, and (ii) people can themselves move more quickly and easily to other places to gain access to goods in them. Extensive transportation, information and communication systems have been developed to this purpose, including structures like roads, automobiles, airplanes, airports, canals, oil pipes, satellites, and television sets. In recent years, connectivity development has even included the development of and connection to novel places that have no identifiable location in physical space, i.e., places in cyberspace.

In this essay, I will refrain from discussion of the role of local development in geographical disembedding, and will instead focus on the role of connectivity development. I take connectivity development to be an attempt by human beings to overcome the limitations of geographically situated places through efforts to 'shrink' or even abolish their distance to other geographical places, or to even create novel, 'virtual' places that link to them. I will call these attempts to 'shrink' and 'create' space and place *space shaping*. Space shaping is performed through the deployment of *space-shaping technologies*, that are technologies that are able to 'shrink' or 'create' space.^{iv} These include the aforementioned transportation, information and communication technologies.

Connectivity development geographically disembeds places by making their nearness to other places less a function of geographical, physical distance, and more a function of various kinds of *relative distance*. The notion of relative distance has been used in geography to denote conceptions of distance between places that are defined in pragmatic terms, such as the time and cost it requires to move from one place to another.^v I will construe this notion similarly but more philosophically to denote the ease by which (aspects of) goods in one place can be made *available* to individuals located in another place. Space-shaping technologies enhance the availability of goods in other places. Goods may be made more available by enhancing their use availability, perceptual availability, or informational availability. *Use availability* is the ease by which goods can be made available to use, modify, or otherwise affect them. *Perceptual availability* is the ease by which goods can be made available to be perceived (in particular, to be seen and heard). *Informational availability* is the ease by which (perceptual or linguistic) information about goods in other places can be gained. To illustrate, television has served to enhance the

perceptual availability but not the use availability of places, whereas airline connections have also enhanced their use availability.

Space-shaping technologies have made the geographical distance between places increasingly inadequate as a measure of the relative distance between them. A place like Johannesburg may in many ways be closer to a geographically distant place like New York, with which it maintains high connectivity, than to a small town eighty miles away in the South-African countryside. Indeed, the intensification of space-shaping processes in the twentieth century appears to have ushered in a new geographical order in which traditional, metric conceptions of distance are increasingly inadequate.^{vi} Places and the individuals in them are increasingly less determined by their geographical location and more determined by their location in a global web created by space-shaping technologies.

The aim of this paper is to show how the development of various space-shaping technologies yields a geographical disembedding of place. I will have little to say as to what is causing these technologies to be developed, and hence what motivates connectivity development. I have suggested that this development may be due to a general drive of human beings to overcome the limitations of their physical environment and have access to more goods. Indeed, many authors, from seventeenth century philosopher Francis Bacon to twentieth-century media prophet Marshall McLuhan, have interpreted technology as a means to satisfy the human drive for greater power and control over the environment. Any such general explanation of the space-shaping dynamic will probably have to be supplemented by more detailed explanations that relate this dynamic to more specific historical constructs, like the institutional structure of modernity and the inherent dynamics of capitalist economies.^{vii}

3. Time-Space Compression and the Shrinking World

It is already a cliché to say that our world is becoming smaller. Many have claimed that we live in a 'shrinking world,' in which distances are increasingly meaningless, and space and time are being progressively conquered. This phenomenon has been described alternatively as the 'shrinking of space and time,' 'time-space convergence,' and 'time-space compression,' the term that is adopted in this essay.^{viii} Marshall McLuhan even went as far as to suggest that we are now living in a 'global village,' a world whose inhabitants have abolished distance.^{ix} In most discussions, the notion of a shrinking world is used as a intuitive concept to capture felt experiences of

dissolving boundaries between places and the increasing meaningless of distance. I will now investigate whether and how this intuitive concept can be provided with a more rigorous foundation.

One of the first authors to analyze the intuitive notion of a shrinking world was the geographer Donald Janelle, who in the late sixties introduced the influential notion of *time-space convergence*.^x Janelle introduced this notion as a way to measure the notion of a shrinking world. Time-space convergence is the process of places moving closer together (or sometimes farther apart) in travel and communication time. The *travel time* between two places is the amount of time needed to travel from one place to another using the fastest available mode of transportation. The *communication time* between two places is the amount of time needed to exchange information between two places using the fastest communication medium available. As the travel and communication times between places shrink, they may be said to move closer to each other in *time-space*, a theoretical construct in which distances between places are not defined as metric distances, but as *time-distances*. The time-distance between two places is the time needed to cross the physical distance between them.

With these notions, it can be shown that although the absolute, metric distance between places is fixed, the time-distance between many places in the world, particularly in the West, has been shrinking steadily over the past two centuries. The distance of 210 miles between New York and Boston, for example, took 4700 minutes to cross in 1800 (by stagecoach), but only 300 minutes in 1965 (by automobile). Nowadays, the cities are even nearer in time-space because of regular air service between them. Likewise, the communication distance between New York and San Francisco has been decreasing because of the introduction of faster communication technologies. In particular, the *telephone distance* between them (the time needed to place a call from one city to the other) was reduced from fourteen minutes in 1920 to less than thirty seconds. There has hence been a quantifiable time-space convergence between major cities like these, in that they have been moving closer to each other in time-space in several respects.^{xi}

The notion of time-distance can be used as a measure to give quantitative content to the notion of a shrinking world. It is, however, only one measure, as reductions in travel and communication time may not be the only factors that occasion the experience of a world becoming smaller. Janelle suggests *cost-distance* as a second relevant measure. This is the distance between two places defined in terms of the cost of crossing the physical distance between them. The cost-distance between many places is also shrinking, and consequently there is a *cost-space*

convergence between them. For example, the cost of telephone calls between distant places has been decreasing steadily over time, and progressive decreases in the cost of air travel have been working to decrease cost, along with time, as a barrier for travel to distant places.

Janelle's analyses show that two of the main barriers that create a sense of distance between places, time and cost, are being eroded more and more. Indeed, I want to suggest, the notion of eroding barriers between places may be the key behind the concept of the shrinking world. *Barriers* between places may be defined as factors that help maintain relative distances between places. Relative distances relate to the ease by which places and goods in them can be made accessible. There appear to be several types of accessibility relations between places. The two discussed by Janelle may be called *travel accessibility*, which is the ease by which one can move from one place to another, and *communications accessibility*, the ease by which communication links can be established between places. Other relevant accessibility types may include *informational accessibility* (the accessibility of relevant information about other places), and *visual accessibility* (the ease by which one can find out about other places through recent visual footage). These are different ways in which the perceptual, informational and use availability of goods in places is enhanced.

I also want to suggest that there are barriers other than time and cost barriers that limit place accessibility. The most important one is *effort*: People are not only kept from traveling to distant places or placing calls to people in distant places because it requires a lot of time and money, but also because it requires too much effort. Travel, for example, may require intensive physical effort (e.g., lifting heavy luggage) and cognitive effort (e.g., planning a trip and making arrangements). Effort-barriers between places have been reduced over time along with time and cost barriers, through efficiency measures and improvements in service. The shrinking world may consequently be analyzed as a world in which many places are moving nearer to each other in time-, cost- and effort-distance relating to travel, communication, perception, and informational access.^{xii}

Janelle attributes the occurrence of time-space and cost-space compression processes to *space-adjusting technologies*: technologies that adjust the time- and cost-distance between places. These include transportation and communication technologies generally, insofar as they work to speed up travel and mediated communication and decrease their cost. Ever faster and cheaper transportation and communication technologies are hence the immediate cause of time-space compression. It should hence be clear how space-adjusting technologies contribute to the geographical disembedding of places. They decrease the amount of time, cost

and effort it takes to travel to, communicate with, see, or be informed about (goods in) other places, thereby decreasing the importance of geographical distance as a determinant of the relative distance between places.^{xiii}

4. Time-Space Distanciation and Global Interdependence

The notion of time-space compression is sometimes confused with the notion of *time-space distanciation* that was introduced in social theory by Anthony Giddens.^{xiv} This is however a quite different process. It does not apply so much to places as it does to social relations and the social systems that contain them. It can be defined as the *stretching* of social systems (like societies and organizations) and social relations (like employer-employee and manufacturer-client relations) across time and space. Social systems and relations are *distanciated* in space and time as a result, which also implies a new type of interaction: *distanciated social interaction*, in which the interacting parties are removed from each other in space and often in time as well. A company, for example, may issue an order in New York that is received and acted on days later in a manufacturing plant in Malaysia. A consumer may order a book over the Internet, which may result in the processing of her order somewhere else days later, which may result weeks later in her receiving a package in her mailbox.^{xv} Distanciated social interaction stands in contrast to ordinary face-to-face social interaction, in which parties are present in the same space-time frame.

Giddens argues that modern societies are marked by their high level of time-space distanciation. He goes on to identify two conditions that are satisfied in modern societies but not in premodern societies that have made this distanciation process possible. The first condition is the *separation of time and space*. In modern societies, time and space have been disentangled from both each other and the contextual features of local places to which they were tied, to become separate, 'empty' parameters that can be used as structuring principles for large-scale social and technical systems. This separation process was effectuated by the introduction of the mechanical clock in the fourteenth century, fixed-viewpoint perspectival maps and global maps in the fifteenth century, and the establishment of analytic geometry in the seventeenth century, and has been continuing since then, with the introduction and further dissemination of still better and more universal time-keeping systems (e.g., universal time zones) and mapping systems.

As Giddens explains, time and space in premodern societies were still linked to both each other and to place. Local places, in which social life was conducted on a

face-to-face basis, gave content to the then prevailing notions of time and space. Time was marked by reference to places and the social interactions and events taking place in them, although regular natural occurrences like sunrise also constituted reference points. To refer to a particular time, for example, one referred to 'when the last dinner was finished' (or 'when the sun came up'). Space was similarly marked in terms of place. Distance was measured by reference to distance between familiar places, and maps were not attempts to locate places in an independently existing space, but to locate them relative to each other.^{xvi}

Giddens claims that the mechanical clock introduced an 'empty' dimension of time that was independent of place, and that global maps consecutively introduced a similar 'empty' dimension of space, in which there was no privileged viewpoint and places were mere locations in an independently existing space. This 'emptying out' of time and space separated these dimensions both from each other and from the contingencies of places. Giddens emphasizes that this separation allowed time and space, as 'empty' parameters, to be recombined in ways that coordinate social activities in large-scale forms of organization. Such organization, however, still relied on a second precondition of time-space distancing: The lifting out of local contexts of social relations and institutions by *disembedding mechanisms*, which are media like money, time-tables, organization charts, and systems of expert knowledge. Disembedding mechanisms define social relations and guide social interactions without reference to the peculiarities of place. Their combination with time measurement and geographical mapping systems that rely on 'empty' conceptions of space and time makes possible the precise coordination of actions of physically remote human beings that is found in distanced social systems.

Whereas time-space compression implies places moving closer to each other, time-space distancing gives rise to a different phenomenon that Giddens calls 'place as phantasmagoric'. This is 'the process by which local characteristics of place are thoroughly invaded by, and reorganized in terms of, distanced social relations.' The globalization of social activity through time-space distancing leads to an 'interlacing of social events and social relations 'at distance' with local contextualities.' This produces a 'dialectic of the local and global' in which 'events at one pole of a distanced relation often produce divergent and even contrary occurrences in another.'^{xvii} This dialectic has consequences for individual places, in which no longer just local interactions and events determine their characteristics, but 'absent' distanced social relations and events become equally important. Decisions made in financial markets in New York and Tokyo may cause unemployment hikes in Dublin, Ireland, and the development of downtown shopping areas may be as

much determined by distanced social relations with national chain stores as it is by local governance.^{xviii}

How, finally, is time-space distancing a factor in the geographical disembedding of place? Time-space distancing is a process by which more enduring forms of social connectivity between places are established. Through it, human activity in one place can constrain and be constrained by human activity in other places, which may result in places being profoundly changed because of their distanced social relations with other places. Not all these changes necessarily imply geographical disembedding, however. A distanced social relation of a city council in a place with a contractor elsewhere may result in a well or office building being built in this place, which changes its identity, but does not change its relative location with respect to other places.

There are two ways, however, in which time-space distancing does contribute to geographical disembedding. First, distanced social relations constitute a necessary condition for the maintenance of the space-adjusting technologies discussed in section 3, and hence for the geographical disembedding these instigate. Second, time-space distancing makes human activity less constrained by the *local social-geographical features* of places, that is, the ecology of social relations that exist within a place, as distanced social relations may often impose more important social constraints. What Giddens calls 'disembedding mechanisms' hence contribute to the geographical disembedding of places because they disembed some of their social-geographical features. Taking these two aspects together, I claim that time-space distancing is a means to establish and coordinate (unilateral and bilateral) relations of use availability between individuals or organizations. A distanced employer-employee relationship, for example, makes the labor power of the employee available to the employer in spite of the distance between them.

This is a way of overcoming some of the limitations on use availability that space-adjusting technologies cannot take away: space-adjusting technologies can enhance the perceptual and informational availability of goods in other places, and can facilitate their use ability through travel and transportation, but (barring certain systems that enable tele-operation) they cannot make goods in one place available for use to one while one is located in another. Time-space distancing makes distanced people available for use, through the manufacture of social relations that, as Giddens emphasizes, rely on trust as a binding element (e.g., trust that others in remote places are cooperating with one on a project, or trust that money in one's possession will be accepted in remote places.) The use availability of people made

possible by distanced social relations often functions as a condition of the facilitation of the availability of goods in the remote places where these people operate. For example, if you want bananas from Brazil without going there, distanced social relations that ultimately link local growers with your local supermarket work to guarantee their use availability in your place.

5. Space Blending and Electric Media: the Fusion of Places in the Global Village

In the analysis of time-space compression in section 3, this phenomenon was identified as due to space-adjusting technologies that 'shrink' space and so bring places closer together. I will now argue that a large subclass of space-adjusting technologies, consisting of technologies that rely on electric modes of transmission of information, do not just 'shrink' the distance between places, but actually work to *blend* places and spaces together. Electric media *abolish* some of the time-space barriers between places that could only be made smaller by other space-adjusting technologies (transportation technologies and non-electric media like the printing press, the postal service system, and photography). These latter technologies may be called *space-compressing technologies* as they compress, but do not abolish distance between places. With them, distant places still remain relatively separate spheres of action. Electric media, however, are capable of bringing two places into actual contact with one another.

Electric media make it possible to be physically located in one place while simultaneously perceiving aspects of other places. In this way, they enable a *partial permeation* of places by each other, in that features in one place are made available as objects of perception (and sometimes even use) in another place. This partial permeation can occur in one or in two directions. Television is a one-way medium, as it blends perceptual and auditory features of one place into other places to become part of their environment. Telephone is a two-way medium, as it blends two places into each other by making their auditory features mutually available.

One of the to observe this phenomenon of space blending was Marshall McLuhan. His *Understanding Media* can be read as an extended case for the fundamental difference between electric media and the 'mechanical' technologies, as he called them, that preceded them. As McLuhan noted, electric media do not just shrink space and time, as some of these older technologies do, they go on to abolish it. As he put it,

After three thousand years of explosion, by means of fragmentary and mechanical technologies, the Western World is imploding. During the mechanical ages we had extended our bodies in space. Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned.^{xix}

McLuhan claimed that electric media contract what was first expanded through other technologies. As he puts it, 'The stepping-up of speed from the mechanical to the instant electric form reverses explosion into implosion.'^{xx} McLuhan's position can be clarified by reference to Giddens' notion of time-space distanciation. Previous, 'mechanical' technologies have helped to create large-scale, distanciated social systems, and have thereby moved attention away from local place to disclose a world of interdependent yet fundamentally dissociated places. With the emergence and widespread use of electric media, these dissociated places are suddenly all drawn together, in an 'implosion' that blends them together and makes them even much more interdependent.

The result of this implosion is what McLuhan calls a 'global village.' The label 'global village' appears to be apt in at least three ways. First, electric media enable its inhabitants to find out about or even witness global events instantaneously. This is like life in a local village, in which events of interest to the community are usually local events are either experience directly or are found out about quickly. Second, electronic communications media allow for instantaneous communication with remote individuals. This is like the instantaneous communication in villages, in which most anyone can be contacted fast for face-to-face consultation. Third, electric media make a direct and interactive coordination of social activities over remote distances possible, just like local coordination of such activities in villages. For example, a police force may pursue a criminal over an area of hundreds of square miles through a coordinated chase using mobile telephones. Distanciated social interactions hence take on a new dimension with electric media, that of instantaneity. Together, these three properties of electric media sometimes make living in a global society seem like living in a global village.

Lacking in McLuhan's account, however, is a detailed analysis of how electric media fuse places together. Fortunately, this topic is taken up by Joshua Meyrowitz, in a study of how electric media transform places and social situations.^{xxi} Meyrowitz claims that electric media create new *social situations* or *social settings*, that are social environments or 'contexts' in which

certain types of behaviors are socially expected and exhibited. Examples of social settings are concerts, marriage ceremonies, counseling sessions, hospitals, public squares on Sundays, and restaurants during dinner time. Social settings are defined by various factors, including social custom and legal and cultural codes. Most important, however, is *the pattern of information flow*, which is the pattern of access to *social information* by various actors in the social setting. Social information is 'all that people are capable of knowing about the behavior and actions of themselves and others,' including 'words, gestures, vocalizations, posture, dress, and pace of activity.' Meyrowitz explains: 'When we find ourselves in a given setting we often unconsciously ask, "Who can see me, who can hear me?" "Who can I see, who can I hear?" The answers to these questions help us decide how to behave.'^{xxii} These questions are answered by analyzing social settings as *information-systems*, as given patterns of access to the behavior of other people.

Before the advent of electric media, the pattern of information flow in social situations was largely determined by the physical environment in which the social setting was established. Social situations were place-bound. Structures like buildings, walls and windows determined who could see and hear whom, and helped create various social settings for human activity. One could usually find out the kind of information-system one was in by observing one's physical environment. Nowadays, one also has to take into account the presence of electric media, that may make others visible or audible to one, or may make one visible or audible to others. Electric media hence change social settings through their transformation of existing information-systems. A medium like television helps create one-way 'windows' between distant places, and telephony may even create a 'private chat-room' that blends (part of) the two spaces in which the callers are located.

Meyrowitz's theory provides insight into the process of space blending by analyzing it as the establishment by electric media of patterns of information flow between previously separated information-systems (i.e., spatially separate places). There are limitations to his theory, however, as a general account of space blending, as it only considers social information flow. Certainly, space blending also occurs when someone's social situation is not modified, for example if someone in Boston watches a news report showing live footage of an oil spill in the Pacific, which does show humans behaving. Meyrowitz's theory can be easily modified, however, by redefining information-systems as systems of access to *any* kind of perceptual

information, rather than just social information. Space blending is then the process by which electric media blend information systems contained in separate places by establishing perceptual information links or 'windows' between them.

Let me now relate the process of space blending more explicitly to the processes of time-space compression and time-space distancing. Space blending can be analyzed a special type of time-space compression, in which some aspects of the informational and communicative distance between places are not just shrunk, but actually abolished, and places come to informationally permeate each other. Electric media can moreover be used to help maintain and coordinate distanced social relations and interactions. Especially the telephone is used in this way, although news and information broadcasts on television and radio may also serve this function. Distanced social interactions through electric media differ from other distanced social interactions, because of their immediacy and their greater resemblance to face-to-face interactions.

How, finally, do electric media geographically disembed place? Since they are space-adjusting technologies, the general way they do this was already discussed in section 3. What is distinctive about electric media, however, is the *intensity* with which they geographically disembed places. By allowing places to partially blend together, they manage to abolishing geographical distance between places as a factor in determining their perceptual (and sometimes even their use) availability.

6. The New Geographies of Cyberspace

6.1. Computer Media and the Nature of Cyberspace

In the previous section, I analyzed electric media as technologies capable of blending distant physical spaces. I will now argue that *computer media*, especially computer networks, constitute a special type of electric medium that requires special consideration. I define computer media as computer-based information and communication systems such as desktop computers, computer networks, and virtual reality systems, that communicate with users through a digital interface, usually

involving a screen and a keyboard or other input device. Computer media, I claim, have unique capacities of *representation* and *simulation* that allow them to *generate* new spaces, rather than just blend existing spaces together. They are hence *space-generating technologies*. The new spaces they generate have no identifiable location in physical space, and may therefore be called *virtual spaces*. The capacity to generate virtual spaces is most evident in virtual reality systems, which simulate immersive, interactive virtual environments that have no systematic relation to physical space. I will argue, however, that similar generative abilities can also be demonstrated in other computer media. This will then lead me to consider ways in which computer media are geographically disembedding physical places and are generating new, virtual geographies.

The idea that computer media create new, virtual spaces and places is certainly not new. Since the late eighties, the term 'cyberspace' has been used as a term to such denote such virtual spaces. Mostly, this term is used to denote the total set of interactive environments generated by computer networks in general, and the Internet in particular. In most discussions, however, the status of this term remains unclear. Is 'cyberspace' a metaphorical term, in the way that the expression 'surfing the Internet' is mere metaphor, or can it be defended that virtual spaces, although not physically realized, should qualify as genuine spaces that are essentially analogous to physical spaces? To answering this question, more precise definitions of cyberspace are needed first. The term 'cyberspace' is ambiguous, as it is used to denote computer environments ranging from a plain MS-DOS operating system to hypothetical future mergers of the Internet with virtual reality technology. I will here adopt a helpful distinction made by Featherstone and Burrows between three varieties of cyberspace.^{xiii}

(1) *Barlovian cyberspace*. This is the set of virtual, interactive environments generated by the existing international network of computers. Named after Internet pioneer John Barlow, it is a virtual space nowadays used by some 40 million people. Barlovian cyberspace shows up as a mostly two-dimensional environment on the screen and is largely text-based, although it also includes images and video and audio functions. The ordinary working environment of personal computers may also be defined as Barlovian cyberspace.

(2) *Virtual reality (VR)*. This is a computer-generated immersive, three-dimensional, interactive environment that is accessed and manipulated using stereo headphones, head-mounted stereo television goggles, datagloves that allow for touching and grabbing virtual objects, and computerized clothing that senses the

relative position of body parts. The simulated environment is constantly being reconfigured in response to bodily movements.

(3) *Gibsonian cyberspace*: This is the original concept of cyberspace, first used by William Gibson in his science fiction novel *Neuromancer*.^{xxiv} It can be interpreted as an imagined future merger between the Internet and VR systems, in which users put on headsets and other VR equipment to access global databases through three-dimensional graphic interfaces, and to interact with other users in simulated environments.^{xxv}

Clearly, VR environments and Gibsonian cyberspace qualify as genuine virtual spaces, as they are both immersive, interactive, three-dimensional environments in which people can act and interact. The current international network of computers, however, only contains Barlovian cyberspace. To what extent can this network be interpreted as creating new spaces and places?

6.2 Space and Place in Contemporary Cyberspace

What appears to speak against a conception of international computer networks as containing virtual spaces and places is that most of its software does not simulate interactive, three-dimensional environments. Most of what is represented is flat text, and *prima facie* it seems inappropriate to describe text pages or documents such as those found on the World Wide Web (WWW) as 'spaces' or 'places' or even 'environments.' Still, I will argue, there is a clear sense in which computer networks, and even ordinary personal computers, do contain virtual spaces and places.

To have this case made, it is necessary to consider the way computer media function. It is an essential property of computer media that they are devices that manipulate *symbolical representations*, or symbol structures, or symbols in short. Many such symbols remain invisible to users, as they are 'machine code' that is interpreted by the machine. Larger symbolical structures, that rely on these lower-level symbols, may however be made accessible to users as objects that they can manipulate. They are usually made visible on the screen, where they are represented by an icon (e.g., one that depicts a folder) or a symbol string (e.g., 'msdos.exe' representing a program). Such symbolical structures I will call *virtual objects*. They are virtual rather than real objects because they do not have a physical form or location, although they may be represented on computer screens by icons that do have shape and location.

Consider, by illustration, the virtual working environment created by a modern operating system, like Microsoft Windows or Macintosh OS. Its virtual

'desktop' will normally show various virtual objects, such as files, folders, a trash bin, program icons, open windows, and a pointer. A page on the WWW can also be considered a virtual object, that will moreover contain various virtual objects itself, such as words, hyperlinks, and buttons. Even the old, pre-Windows operating system MS-DOS contains virtual objects. It can only display linguistic and numeric symbols, but these symbols still refer to manipulable virtual objects in the computer, such as files, directories, and numbers.

The notion of virtual object allows us to make sense of the notions of place and space in contemporary computer media. First, a *place* in contemporary, Barlovian cyberspace is a virtual object that is able to *contain* other virtual objects and so may come to function as an *environment* in which other virtual objects may be encountered and activities may take place. This definition of place fits my original definition in section 2 of place as an area or space that perceived or used as a site of human activity. Windows, desktops and folders constitute places in this sense, as do structures on the Internet like web-pages, web-sites, virtual chat-rooms, Multi-User Domains (MUDs), and newsgroups.

Second, contemporary cyberspace constitutes a *space* because it consists of a system of *topological relations* between virtual objects. This space is a *topological space*, rather than a geometric space, because the relations between virtual objects in contemporary cyberspace are not, or not primarily, defined in terms of geometric distance. The notion of a topological space has been rigorously defined in mathematical topology. Roughly, a topological space is an abstract space in which objects are subjected to abstract ordering principles, that define connections and trajectories between objects even though these objects have no location in geometric space. In MS-DOS, for example, files and programs may be contained 'in' directories, even though none of these objects have geometric shapes. *Web-space*, as another example, is the topological space generated by the system of hyperlinks between pages on the WWW. As one finds oneself at a particular place 'in' Web-space, one can 'move' to or 'visit' another location, or 'return' to a previous one, even though Web-pages maintain no (real or virtual) geometric spacings. Contemporary cyberspace hence contains what may be called a *virtual geography*, a topological structure defined over virtual objects.

Activities performed in cyberspace may be called *virtual activities*, as they consist in the manipulation or perception of virtual objects. Examples of virtual activities include deleting a file, posting an e-mail message, making a move in computer chess, reading a Web-page, painting a landscape, completing a virtual order form, and chatting with a friend in a virtual chat-room. These virtual activities

take place in virtual places, as defined earlier. They also partially take place in the real world, however, as they originate in a user who is sitting in front of a monitor, while typing on the keyboard or moving the mouse. Virtual activity takes place, one may say, in a blended environment of virtual and physical space. Virtual and physical spaces may permeate each other in two directions. The display makes virtual objects and places part of the perceptual environment of the physical space in which the user is located, and the keyboard and mouse extend one's hands into virtual space to manipulate these objects. Virtual spaces may moreover blend with more than one physical space at once, as in MUDs, chat-rooms, and networked computer games, to become shared spaces. Such virtual spaces indirectly blend physical places that may be thousands of miles apart.

6.3 The Flight to Cyberspace

Human activities in contemporary cyberspace are naturally more limited than those possible in more Gibsonian forms of cyberspace. It turns out, nevertheless, that many important human activities do not require three-dimensional, immersive virtual environments. Contemporary cyberspace is a terrain that has the potential to become a site where a significant proportion of human conduct takes place. Certainly, this has already happened with the individual cyberspaces found in personal computers, and it is happening with cyberspace in computer networks. For some individuals, life in cyberspace is already more engrossing than life in physical space, as for the college graduate interviewed in Sherry Turkle's *Life on the Screen*, who claims: 'I feel that I have more stuff on the MUD than off it.'^{xxvi} I will argue that we are currently witnessing a *flight to cyberspace*, in which the physical, geographical terrain as a site of human activity is being partially replaced by the virtual terrain of cyberspace, as more and more human activities are being relocated to cyberspace. As contemporary cyberspace is getting bigger, faster, and more sophisticated, this flight can only be expected to intensify.

To be replicable in cyberspace, a human activity must be analyzable as, or reducible to, an *information processing task*. Part of the reason is, of course, that computer media are by definition information-processing devices. Notice, however, that virtual human activity is not only sustained by the information-processing capacities of computer media, but also by the information-processing capacities of their users: their abilities to think, perceive information on the display, and issue commands to the computer. It is therefore not just the computer, but the computer in cooperation with the user that is doing information processing. Computers and

users team up to constitute *hybrid information-processing systems*, where both units process information internally and exchange information to each other. The question is now what human activities in physical space can be replicated by the information-processing activities of human-computer tandems.

I claim that at least four important classes of human activity can be, and are being, replicated in this way. First, there are what I call *experiential activities*: activities that have as their primary aim to have certain perceptual experiences or to absorb certain types of information. These include activities like reading, watching pictures, and viewing landscapes. The objects of normal experiential activity, such as books, magazines, letters, art collections, photographs, and videos can be transformed into digital format to be displayed on computer screens, thereby making experiential activities possible. Second, many *creative activities*, activities that are intended to produce new products and forms, can also be virtualized. A condition is that the intended product can be reduced to a digitally coded form. Computers can be used, for example, to create texts, drawings, edited video films, music scores, computer programs, new data that are the outcome of simulations, and design blueprints. Third, *verbal communication* can take place in cyberspace, both in delayed form (e-mail, electronic bulletin boards, newsgroups) and in real time (Internet Relay Chat, MUDs).

The fourth class includes *institutional activities*, that are activities the character of which is constituted by socially sanctioned interpretations of them. Take for instance the activity of paying off a debt to someone by handing them a twenty dollar bill. Now, it is essentially arbitrary that giving someone a green piece of paper would count as paying off a debt. It is only because this type of piece of paper has a sanctioned interpretation, that it is a valuable object that can be used to pay off debts. This interpretation of it is dependent on it being part of an established social institution, the institution of money. Many activities and objects are similarly dependent for their meaning on social institutions, such as activities of buying, selling, marrying, signing legislation, and making a move in chess. These activities depend on social institutions like money, property, marriage, law, and chess, that issue interpretive rules concerning the meaning of certain classes of objects and activities. Now, most such activities can be transferred to cyberspace by devising new such rules that are applied to virtual objects and activities. Indeed, many such institutional activities already take place in cyberspace, including ordering, selling, banking, voting, gambling, stealing, trespassing, taking a test, joining a club, and even marrying ("Please press "yes" or "no"!").

The reproducibility of such a large part of human activity in cyberspace makes it possible for cyberspace to function as a place that we do not just occasionally visit but that we also come to *inhabit*. Indeed, in *City of Bits* William Mitchell argues that we are building a virtual geography that could best be likened to a city.^{xxvii} This 'city of bits,' in many ways similar to cities made of atoms, has the potential to take over many functions traditionally served by cities. Mitchell points out the many analogies between cyberspace and cities: They are both artificial infrastructures, they both contain places that function as sites of human activity and that are linked to each other by a topography, places in them can be public or private, and both are governed by regulatory systems that organize and control access to places. Looking with more detail, one finds many places in cyberspace that are also found in cities. One finds stores ('netstores'), malls ('cybermalls'), virtual museums, peepshows, virtual schools and universities, electronic trading systems, virtual banking chambers, electronic work floors, electronic sidewalk cafes, electronic game parlors, electronic churches, virtual assembly rooms, electronic town halls, and so on. Many of these structures help define *virtual communities* of individuals who maintain social ties in cyberspace.^{xxviii}

Mitchell predicts that the current flight to cyberspace will intensify, and that much of the economic, social, political and cultural action found in geographical, physical cities will shift into cyberspace. This includes the replacement of many public places found in cities by 'virtual agoras.' He predicts that as a result, geographical cities will be radically transformed. A large part of their infrastructure will become obsolete and will gradually be downsized and transformed. Many public places will disappear, along with a large part of the tertiary sector. Naturally, this will also have implications for the secondary sector: as physical spaces and objects are replaced by virtual ones, the demand for construction and industrial production may be expected to decrease. Physical places, especially homes, will become more malleable and multifunctional, as computer media in them make it possible for them to be used for many different purposes.

6.4 How Cyberspace Geographically Disembeds Place

The flight to cyberspace may well turn out to be less dramatic than Mitchell expects. Even as many human activities are replicated in cyberspace, their physical counterparts may well continue to exist. The telephone may have diminished the frequency of face-to-face conversations somewhat, but it has not replaced them. Likewise, I think we can expect that many physical places, and the physical objects

and human activities they hold, will end up existing next to their virtual counterparts (e.g., paper journals next to electronic journals, real cafes next to cybercafes, etc.). Even so, there clearly is a flight to cyberspace taking place right now, and cities and the various places they contain are already being transformed as a result. In what way does this 'change from atoms to bits'^{xxix} constitute a geographical disembedding of place?

It does so by enabling individuals to transcend the geographical limitations imposed by their physical location, this time not by reducing its relative distance to other physical places, nor through its local development, but by allowing one to access completely artificial virtual places from it, that have no location in physical space, and are hence not constrained by distance relations of the sort that separates physical places. Notice that the construction of virtual places by space-generating technologies has an important advantage over the adjustment of relative distances between physical places by space-adjusting technologies. Space-adjusting technologies, electronic media specifically, make it possible to overcome the perceptual and informational distance between physical places, but cannot overcome the use distance between them; this distance can only be made smaller through faster transportation technologies. Space-generating technologies, however, open up access to places in a way that guarantees the immediate and complete use availability of the goods they contain. These goods, virtual objects, admittedly lack some of the possibilities of their physical counterparts, but nevertheless allow for many useful applications.^{xxx}

7. Conclusion

In the preceding sections, various conceptions of space have been discussed, like time space, cost space, and virtual space, that do not reduce to some measure of physical, metric space. Apparently, physical space is only one of several types of space relevant to human location and orientation. Geographer Peter Gould accounts for this fact as follows:

[M]any spaces of great interest to human geographers are not strictly metric at all (...) In fact, for many spaces of great geographic importance the very notion of metricity may not be pertinent. What may be much more important is the simple fact of how people and things are connected together. It is the sheer *connectivity* of things

that creates many spaces of interest to a geographer, spaces that a mathematician would call topological spaces.^{xxx}

I have suggested earlier that the notion of connectivity relevant to an understanding of the places and spaces inhabited by human beings is a *pragmatic* notion, according to which mappable connections between places are defined in terms of various sorts of availability relations between places and their goods, relations that are ultimately defined in terms of human interests in having fast, inexpensive, and easy access to goods.

As noted by Abler et al., geography from before 1950 was preoccupied with absolute, metric notions of distance and location, but geography after 1950 has become increasingly involved with mappings that employ relative notions.^{xxxii} This novel interest is perhaps not coincidental in light of the great flight that space-shaping technologies have been taking in especially the past sixty or seventy years. New space-shaping technologies have been posing new challenges to geographers, the most recent challenge being posed by the new geographies of cyberspace.

A pragmatic conception of space and place makes it possible to understand the historical evolution of the various space-shaping processes and technologies discussed in this essay, and to understand how these have been changing the identity of places. Place identity has been transformed, first, by the drastic changes in the relative location of places brought about by space-shaping technologies. However, places are also being materially and socially transformed themselves. Connectivity relations between places may cause local development as well as decay and destruction, and may cause massive in- and outfluxes of goods (e.g., local economic growth or decline because of distanced social relations, or flights to cyberspace). This is also eroding the distinctiveness of places. Places can be distinctive because of the presence of certain goods (e.g., buildings, local foods), as well as through the absence of certain goods (e.g., the absence of modern conveniences in places in the Sahara). Space-shaping technologies, however, often ensure perceptual or use availability of special goods in other places, and help introduce goods into places previously made special through the absence of these goods, thereby reducing their specialty and making places across the globe more homogeneous.

Along with changes in place identity, people's sense of place is changing as well. An individual's sense of place is often defined as his identification with a place that he inhabits, if only temporarily. David Canter has argued that places with

which a person maintains a sense of place are thought of by that person as closely related to activities that are so closely tied up to her self-identity, that she wants to maintain close control over their availability.^{xxxiii} However, swift changes in the identity of places brought about by space-shaping technologies and the increased mobility of individuals have made it more difficult to maintain a sense of place. On the other hand, electric media have also worked to make goods from distant places part of one's home environment, thus allowing them to become included in one's 'sense of place': movie characters, distant friends on the telephone, and places and things in cyberspace can become familiar goods to which one may grow attached.^{xxxiv}

It is important to realize, moreover, that different social groups will be subjected to different impacts from space-shaping technologies, and may consequently end up with different senses of place. A major reason why space shaping affect different social groups differently is that access to space-shaping technologies is unequal between social groups. An individual's opportunity to make use of a space-shaping technology like a computer network, a telephone, or an airplane strongly depends on that person's social and economic position, and increasingly also in his or her technological competences and skills. For the average Western business executive, space-shaping technologies have truly turned the world into a global village. For the African peasant who has no access to advanced space-shaping technologies, however, geographically distant places may be just as far away as they were for his forefathers twohundred years ago, and his sense of place may remain relatively unaffected. For the African peasant who gets to watch television every night in the village square, but who is unable to make a telephone call or an airplane flight, things are different again. Television allows her to become an observer of all kinds of places besides her own village, thus affecting her sense of place, but these places will never get the status of places that can be visited or contacted. Her lifeworld remains confined to her village, and the neighboring places to which she has access.

Finally, the geographical disembedding of places has lead to changes in our very conception of what a place is. In our contemporary conception of place, places are no longer just understood as inhabitable physical locations, but as any relatively stable environment that holds certain immediately available goods. Next to physical places, such places include places that emerge out of the blending of different physical places by electric media, and nowadays even software constructions in cyberspace.

Endnotes

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- ⁱ D. Seamon, *A Geography of the Lifeworld* (London: Croom Helm, 1979).
- ⁱⁱ Y. Tuan, *Space and Place. The Perspective of Experience* (London: Edward Arnold, 1977), pages 179 and 6.
- ⁱⁱⁱ D. Canter, *The Psychology of Place* (New York: St. Martin's Press, 1977).
- ^{iv} This concept is intended as an extension of the concept of space-adjusting technologies introduced by D. Janelle, 'Central Place Development in a Time-Space Framework,' *Professional Geographer* 20 (1968): 5-10. Cf. section 3.
- ^v For example, A. Gatrell, *Distance and Space. A Geographical Perspective* (Oxford: Clarendon Press, 1983).
- ^{vi} See S. Brunn and T. Leinbach, 'Introduction,' in *Collapsing Space and Time: Geographic Aspects of Communications and Information*, ed. S. Brunn and T. Leinbach (London: Harper Collins, 1991), xc-xxvi; D. Janelle, 'Global Interdependence and Its Consequences,' in *Collapsing Space and Time*, 49-81; S. Sassen, *Cities in a World Economy* (Thousand Oaks, CA: Pine Forge/Sage Press, 1994).
- ^{vii} Modernity is singled out by A. Giddens, *The Consequences of Modernity* (Cambridge, GB: Polity Press, 1990), and B. Latour, *We Have Never Been Modern*. Trans. C. Porter. (Cambridge, MA: Harvard University Press, 1993); capitalism is pointed to by D. Harvey, *The Condition of Postmodernity* (Oxford: Basil Blackwell, 1989) and J. Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society* (Cambridge, MA: Harvard University Press, 1986).
- ^{viii} Named, respectively, by Brunn and Leinbach, 'Introduction,' Janelle, 'Central Place Development in a Time-Space Framework,' and Harvey, *The Condition of Postmodernity*.
- ^{ix} M. McLuhan, *Understanding Media: The Extensions of Man* (New York: McGraw-Hill, 1964).
- ^x See Janelle, 'Central Place Development in a Time-Space Framework;' 'Spatial Reorganization: A Model and a Concept,' *Annals of the Association of American Geographers* 59 (1969): 348-364; and 'Global Interdependence and Its Consequences.' See also R. Abler, 'Effects of Space-Adjusting Technologies on the Human Geography of the Future,' in *Human Geography in a Shrinking World*, ed. R. Abler, D. Janelle, A. Philbrick, and J. Sommer (North Scituate, MA: Duxbury Press, 1975), 35-66.
- ^{xi} Janelle, 'Global Interdependence and Its Consequences,' 49-51.
- ^{xii} An extensive historical account of time-space compression in which various historical stages are distinguished is found in Harvey, *The Condition of Postmodernity*. Harvey moreover extensive analyses what he construes as the more fundamental cause of this phenomenon: the inherent tendency of capitalism to expand its production system and its markets over space and time in order to speed up the turnover time of capital so as to limit overaccumulation, a fact that has lead to the emergence of a vast network of transportation and communication technologies. Harvey also discusses the perception of space-time compression processes in the arts and human sciences.
- ^{xiii} It should be noted that there are also technologies that may be called space-adjusting technologies that seek to *increase* rather than reduce relative distance between places, by creating new barriers between places. Walls, locks, and v-chips (computerized chips capable of

detecting program ratings and blocking adversely rated programs from view) are examples of technologies that are designed to make it more difficult to access (goods in) one place from another place.

Moreover, as has been noted by D. Harvey and M. Ferguson, reductions in relative distance between places brought about by space-adjusting technologies have not necessarily made distances between places less *important* to individuals and organizations. In an increasingly competitive economy, small differences in the relative distance between places, as measured in time and money, may sometimes even be *more* important as a factor in human decision-making than larger differences were in the past. See Harvey, *The Condition of Postmodernity*, 293-296 and M. Ferguson, 'Electronic Media and the Redefining of Time and Space,' in *Public Communication: The New Imperatives*, ed. M. Ferguson (London: Sage, 1990), 152-172.

^{xiv} A. Giddens, *The Constitution of Society* (Cambridge, GB: Polity Press, 1984; *The Consequences of Modernity; Modernity and Self-Identity* (Cambridge, GB: Polity Press, 1991).

^{xv} Perhaps 'socio-technical interaction' would be a better name, as distanced interactions are sometimes wholly technical (e.g., a computer that automatically sells stock to other trading computers when it drops below a certain price.)

^{xvi} See also Harvey, *The Condition of Postmodernity*, 240-243

^{xvii} Giddens, *Modernity and Self-Identity*, pages 244, 21, and 22.

^{xviii} That time-space distanciation is a process that is logically distinct from time-space is shown by the fact that there have been highly distanced social systems, like the Roman Empire, in which transportation and communication systems were nevertheless relatively slow. Conversely, a world can be imagined in which fast and cheap transportation and communication links between places exist, but which nevertheless contains communities that operate relatively independently from each other and maintain few distanced social relations. In contemporary societies, distanciation and compression processes have been taking place in tandem, in a process of mutual enhancement.

^{xix} McLuhan, *Understanding Media*, 3.

^{xx} McLuhan, *Understanding Media*, 35.

^{xxi} J. Meyrowitz, *No Sense of Place. The Impact of Electronic Media on Social Behavior* (New York: Oxford University Press, 1985).

^{xxii} Meyrowitz, *No Sense of Place*, pages 37 and 39.

^{xxiii} M. Featherstone and R. Burrows, 'Cultures of Technological Embodiment: An Introduction,' in *Cyberspace/Cyberbodies/Cyberpunk. Cultures of Technological Embodiment*, ed. M. Featherstone and R. Burrows (London: Sage, 1995), 1-19.

^{xxiv} W. Gibson, *Neuromancer* (London: Harper Collins, 1984).

^{xxv} An excellent description of such an environment is provided in Neal Stephenson's novel *Snow Crash* (New York: Bantam Books, 1992).

^{xxvi} S. Turkle, *Life on the Screen. Identity in the Age of the Internet* (New York: Simon & Schuster, 1995), 240.

^{xxvii} W. Mitchell, *City of Bits. Space, Place, and the Infobahn* (Cambridge, MA: MIT Press, 1995).

^{xxviii} See H. Rheingold, *The Virtual Community. Homesteading on the Electronic Frontier* (Reading, MA: Addison-Wesley, 1993).

^{xxix} N. Negroponte, *Being Digital* (New York: Knopf, 1995).

^{xxx} For those who remain unconvinced that the spatial metaphor of cyberspace (the 'consensual hallucination,' as Gibson has called it) can be taken literally, I will also suggest a different perspective on computer media. Contemporary cyberspace is essentially of two kinds. The first consists of virtual spaces generated locally by one's personal computer. The acquisition of this computer can also be identified as a species of local development (section 2), as one is modifying one's local environment to create added goods. The second kind consists of virtual spaces that are the joint product of one's computer and distant computers to which it is connected. One can also think of this interaction between computers as a type of connectivity development between two physical places, in which goods (software and information) are exchanged.

^{xxxi} P. Gould, 'Dynamic Structures of Geographic Space,' in *Collapsing Space and Time*, 3-30, 10.

^{xxxii} R. Abler, J. Adams, and P. Gould, *Spatial Organization: The Geographer's View of the World* (Englewood Cliffs, NJ: Prentice-Hall, 1971).

^{xxxiii} Canter, *The Psychology of Place*, 179.

^{xxxiv} See also Giddens, *Modernity and Self-Identity*, 146-7.