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ELECTRONIC VILLAGE: INFORMATION TECHNOLOGY CREATES NEW SPACE†

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The Placer County Planning Commission has given its approval for a subdivision near Foresthill, California that holds the promise of model land use development in the Sierra foothills for the twenty-first cen-

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tury. The subdivision is called Eaglecrest®. It features non-contiguous circular homesites which occupy less than ten percent of a permanent forest park of over 1300 acres, interconnected by conduits for telecommunications paths that will accommodate the complex technology envisioned by electronics experts for the future. This development focuses attention on an issue which is particularly important as our society moves from industrial to information-related technologies. The issue is the impact of technology on the shape and form of our habitat—the communities where we live, work, and play.

Historically, we have focused our attention on the obvious benefits of new technologies. We become so enchanted by the larger results that we often ignore the more subtle, yet perhaps just as powerful, influences. Here, while we note some of the features of a particular technological development—which the media has acclaimed as "the world's first electronic village"—we shall give primary attention to the less obvious issue of the effects this technology has in determining our habitat. The form and shape of community and domicile—the architecture and building codes, planning and zoning practices—serve the prescriptive technology that pervades and gives identity to the epoch dominated by its influence.

The invention of irrigation and plow technology, prescriptive technology at the commencement of the agricultural epoch, contributed to the exploitation of the fertility of the soil. Clockworks and the prime mover, prescriptive technology of industrialization, enabled the full utilization of machine productivity. Similarly, the transistor allows us to capture the vitality and utility of information. Each of these prescriptive technologies has provided direction to an epoch, and informed the lifestyles and the working and living conditions of the period. This Article will call attention to these influences, and contribute to a creative response to the impact that information technology can be expected to have upon both the new communities we plan and develop, as well as the design of the homes which will support our new lifestyles.

I. A FRESH DEPARTURE IN PLANNING AND DEVELOPMENT

A. NEW FACTORS FOR DOMICILING

More than twenty-five years ago, communications teacher Marshall McLuhan taught that electronic technology would cause enormous changes in our perceptions. He talked about the electric surround and the global village.[1] We have now seen how the possibility of instantaneous transmission of voice and image transforms our planet into a village while at the same time creating the need for enlarged personal space.

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1. M. MCLUHAN, UNDERSTANDING MEDIA (1964).

Nineteenth century industrial technology enabled people to live with high density because of what we now perceive to be a mechanical ordering and a slower mechanical speed. Such density is becoming hazardous to our health as we move into the twenty-first century with its juxtapositioning order and intense light speed.[2]

Futurist Alvin Toffler discussed the emerging electronic technology that will facilitate our adjustment to the twenty-first century by creating a new electronic cottage industry.[3] This industry will involve many people who "commute to work" electronically by doing much, if not all, of their work on home computers. Toffler estimates that all but a small percentage of our present industry could be run by people working in their electronically equipped homes. Our dependence upon fossil fuel and freeways will be dramatically reduced as automotive commuting gives way to auto-electronic communicating over micro-wave and fibre optic pathways.

The developers of Eaglecrest® trace their inspiration for the development to the insights of McLuhan and Toffler, and to their general awareness that the information revolution precipitated by the silicon chip is, indeed, an epoch-creating event. Having traveled widely, they were aware of the quiet but growing urban emigration on a firsthand basis. They themselves had been much involved in community life in the Los Angeles and San Francisco Bay areas, and they knew of exurbanites' desire for life away from congestion and pollution in a semirural region.

Their observations were confirmed in 1980, when the California Office of Planning and Research convened an ad hoc committee to study the surprising fact of urban emigration to the twelve Sierra foothill counties. The Foothills Strategy Committee included representatives from each of the boards of supervisors and some of the cities, as well as other experts, including one of the developers of Eaglecrest®. Operating under the assumption that the number of people coming to the open spaces is not likely to diminish, the committee studied all facets of the phenomenon. The studies indicated, among other things, that these people are generally well-educated and tend to create jobs for themselves and others when they arrive. Electronic communication, even in its infant stage, is an important part of their new lifestyle.

While the vision of the developers of Eaglecrest® has yet to be fully unfolded, the foundations have been laid. The developers have exhaustively studied land use theory and technology, as well as community planning, development and zoning practices. They have sought to un-

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2. The theory that technology alters our perception of time and space is discussed further in section I.C *infra*.

3. A. TOFFLER, THE THIRD WAVE 210-24 (1980).

derstand population trends and habitation requirements for the twenty-first century. They have attempted to incorporate state-of-the-art electronic technology into their planning for Eaglecrest®. Realizing that the state of the art is dynamic, they have laid the ground work for future expansion and adaptation. The developers of Eaglecrest® recognize that the present and enlarging reality of the global village, signs of modest but real urban exodus, and the prospects of the electronic cottage® are factors that are already affecting our living habits.

B. HABITAT FOR THE REGENERATION OF THE HUMAN SPIRIT

The regeneration of the human spirit has been associated with high places since the dawn of civilization, when ancient peoples built artificial mountains called ziggurats and pyramids. The rebirth of life has also been associated with an involvement with the soil. Eaglecrest®, situated on some of the most fertile metavolcanic soil in the central High Sierra, provides both. In this spacious environment of high, rich forestland, the speed and intensity of the electronic age becomes surprisingly promising. The developers of Eaglecrest® have catalytically joined the most choice ancient physical environment with the information age sense of space in their planned twenty-first century electronic village®. This project is an invitation—made in part by the gift of electricity—to explore a new space, where the development of persons who are both productive and sensitive will be possible.

An examination of Eaglecrest® suggests that this planned use of the land space supports and encourages the promise of the new space created by electronic technology.

1. *The New Attraction of the High Sierra*

People move to the High Sierra to live in verdant forests, rich with vibrant changing seasons and abounding with wildlife. It is likely that more people would leave their condominiums in the suburbs if they could relocate their work and leisure in a new sequence of space and time. Twentieth century cities, particularly as they move into the information age, are places where intensity increases to match density. The pace of the old cities and suburbs, created by the technology of the industrial age with its nineteenth century "space," was leisurely in comparison with the information-rich environment engendered by electronic technology. Trolleys and trains, cars and buses, ships and planes are insignificant when compared with "reach out and touch someone today" telephonics, or computers processing millions of pieces of information in a second. People are now becoming aware that technology creates a new sense of space and time: low intensity/high den-

sity (industrial age); high intensity/low density (information age). The information age is a a new space/time.

Some people are becoming uncomfortable with the old space and are actively creating new space for themselves; jogging, physical fitness activity, and moving to live in more open places are the early signs. High fidelity stereo, UHF, VHF, cable and satellite TV, home telecommunications, interactive television, telelinked computers for work and leisure, entertainment and educational services have all developed in connection with the new space; they are all graphic signs of the new "electric surround." Community planners and developers must give this fact primary consideration when making century-long land use and housing decisions. The developers of Eaglecrest® have given these matters thoughtful consideration.

2. *A New Land Use Theme: The Circle Homesite*

The Eaglecrest® master plan appears to be something from the twenty-first century. It has some resemblance to electronic circuitry. Closer examination reveals circular homesites interconnected by underground services, in a vast natural forest crossed by creeks and rivulets, perched on the grand canyon of the American River. This ingeniously creative plan for people-space in the woods has already evoked the question, "Why didn't we think of that before?" The answer is obvious: only now are we becoming aware of the new space which electronic technology brings to our psychic awareness. As our awareness grows, we should expect to see even more innovation. Indeed, the developers recognized that this project is only one among a new generation of developments.

The circle lot, central to the Eaglecrest® land use plan, is better understood as a circle homesite or building envelope. These circle homesites are strategically placed throughout the 1348 acres of the master plan so that none are contiguous. To fit the forest, they provide for zero set-back and 360° orientation, rather than the traditional grid pattern subdivision. Every homesite is ringed by wooded open space and vistas. The first residents of Eaglecrest® will discover the richness of living in a forest park environment. To assure this, the developers are planning for perpetual management of the timber-producing forest, which will also stimulate the flourishing population of wild animals and birds. About ninety percent of the project, over 1200 acres, is to be set aside phase by phase as a permanent timber and fuelwood tree farm to be owned in common by the proposed 360 homesite owners, under the board of directors of Eaglecrest® Association.

C. ALTERATION OF OUR SENSE OF SPACE AND TIME

1. *Packaged Space to Simultaneous Space*

Essential to the land use planning incorporated at Eaglecrest® is the theory that electronic technology contributes to a reorientation to space. Just as a prescriptive technology alters our perception of time, so does it change our perception of space. In sharp contrast to agricultural space, where individuals and groups feel comfortable in wide open places with relatively infrequent personal contact, industrial space tightly integrates and concentrates widely differing packages of space and enables individuals and groups to feel comfortable in highly congested areas. The differences arising from the juxtaposition of agricultural and industrial life styles help us understand the mode of response stimulated by information technology.

Fully-loaded commuter trains and subways, crowded walkways, packed elevators, and "parking lot" freeways were the result of accommodation to industrial technology, which compartmentalized space and enabled us to tolerate being squeezed into tight places. Being bumped and jostled about has become so common that we give it little thought. Indeed, there is an excitement that arises from such tight concentrations of people which is exploited by individuals in marketing, sports, politics, the military, and religion. Such congestion produces a thrill for the people of the industrial society comparable to the wonder felt by solitary people in their agricultural society. These contrasting responses underscore the profound effect that a prescriptive technology can have on one's personal appropriation of space.

Clockworks and engines contributed to the packaging of space for a formerly agrarian lifestyle, and made it inviting for many people to leave their old space in exchange for the compact, tightly synchronized, empowering new spaces of industrialization. Now, the tiny micro chip, by concentrating huge amounts of information, is carrying us from the old industrial space to the new information space. The enormous concentration of information transported at the speed of light is vastly expanding our global awareness. The lantern slides of an adventurer or missionary entertaining his viewers at the turn of the century are vastly different from the televised bursts of simultaneous information from around the world, turning us into instantaneous participants.

The prescriptive technology of industry forced us to deal with large amounts of objective material as both workers and consumers. Being objective was the essential industrial metaphor, which the schools and other socializing institutions instilled in us at an early age. Spectatorship reinforced this personal objectification. Objectivity enabled us to ignore the fact that we, ourselves, were being treated as objects in the packaged spaces of the cities. We could even describe ourselves objec-

tively—"like sardines in a can"—and accept the situation as routine. Yet, such physical contact in a former time would have been looked upon as either chaotic or ritually significant.

The relativity of space is becoming more apparent as universal access to information increases. While the metaphor of objectivity allowed us to be comfortable in the congested environment of an industrialized society, the metaphor of subjectivity which is essential to the information age will contribute to an exodus from these impersonal, tightly packaged environments. People are becoming aware that electronic technology is changing our society from location-dependent to location-independent. The issue of the "quality of life" both at work and at home is emerging as a major factor in decision-making. The relocation of corporate operations is no longer based solely on economic considerations, although proponents of relocation may justify their position with the "bottom line." Migration to rural areas by increasing numbers, despite increased commute distances, is further evidence of a reorientation to the new information space. The significant numbers of persons telecommuting, the inauguration of the Association of Electronic Cottagers, an organization fostering and supporting teleworking, and the publication of a handbook providing "everything you need to know to live and work under the same roof,"[4] are all indications of the discovery of the new space.

Planners, builders, and developers—using zoning ordinances and building codes which were the product of the industrial paradigm—can no longer assume the long-term viability of work and residential space based upon the industrial metaphor. We needed such space to function in a society preoccupied with the production of myriad things. Both personal and public space were so highly specialized that we could tolerate the situation. Now, it is quite likely that such tightly compartmentalized space will become increasingly intolerable, as evidenced by the rising physical and psychic ills attributable to this congestion. Soon we will discover that, rather than protecting us, zoning and building practices are contributing to a new phenomenon—space pollution.

Conventional planning wisdom late in the industrial age appeared to recognize some of these factors by advocating open space and green belts. The approach to the problem was typically industrial: the space was mechanized. Manicured parks, athletic fields, golf courses, planned recreation areas, and facilities for organized groups, however, all generally cost more than they produce. In fact, for the most part, zoning proscribed any truly productive activity in these spaces. Developers generally consented to the creation of green belts only reluctantly, since this required them to give up important acreage. Often, green space

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4. P. EDWARDS & S. EDWARDS, WORKING FROM HOME (1985).

was proferred when, in fact, it was not usable for any constructive purpose, since it was rocky, swampy, or inaccessible.

Unless they have been totally co-opted by the industrial metaphor, most people are attracted to the open spaces of farm, forest, shore, and desert because of the life inherent to those environments. Industrial age zoning practices obliterate that life, as evidenced by the fate of once wild or productive spaces under the influence of the industrial notion of location-dependence. Zoning practices adhere to concepts of density, like buffer and transition zones, which contribute to solid gradations of urban sprawl and oppose juxtapositions without "infill." This practice fulfills the industrial paradigm by "separating" residential from commercial and industrial zones to protect such divergent uses.

With the advent of location independence for increasing numbers of people, it is now possible to conceive of enclaves of residential, commercial, and industrial space juxtaposed in the midst of farm, forest, shore, and desert, with sufficient open space to permit their natural product or wildlife to thrive. As we learn to adapt to lifestyles in these new environments which may at first seem strange or objectionable, we will remember the alarming trends in our urban and suburban areas, and by comparison, these new environments will seem friendly and inviting.

Traditional zoning practice tends to oppose such an approach, seeking instead to "protect" rural uses from residential encroachment, and prospective residents from noise, dust, pesticides, and other potentially harmful factors. The results have been most revealing. Suburbs, supposedly protected by industrial planning philosophy, are now suffering the effects of soil, water, and air pollution. We have recently discovered sound pollution, and we will soon discover space pollution. Location independence may be instrumental in creating a new kind of interdependence. Farming and forestry, for example, might have more allies in their struggles if others were more proximate to their operations. As we become more sensitive to the real effects of urban pollution, residential, commercial, and industrial sectors may discover that this kind of "spot zoning" can be advantageous for them as well. As the powerful influence of the industrial paradigm decreases, we may insist that crop and product be produced closer to our dwelling places whenever possible.

Advances in information technology support this new approach to land use planning. The nature of work—even heavy manufacturing—has been radically changed by these advances. Work and living spaces will undoubtedly become far more compatible, facilitated by advances in electronics. In the coming decades we can expect dramatic impacts on both the shape and location of work and residential space. The influences upon land use planning will also apply to domiciling. The possibility of living in hamlets and villages, while at the same time enjoying

the benefits of a very sophisticated culture, is a situation made possible by information technology. Location independence is not a retreat to an earlier, more simple lifestyle. Rather, it is the incorporation of a highly complex culture into a location-independent environment. Location independence will have a far-reaching effect as increasing numbers of people are able to enjoy the simultaneous urban-rural life. Air, surface, and electronic transportation and communication will keep us in touch to a far greater degree than previously imagined, while allowing us to enjoy a new sense of space.

The developers of Eaglecrest® have applied this "information paradigm" to their planning. Building "envelopes" nestled among the conifers, oaks, and maples are being individually selected on the site by the developers. Before each homesite is chosen, consideration is given to the horizontal, vertical, and visual separation from every other homesite. Tree cover, natural vegetation, rock out-croppings, topography, and views become aesthetic values to be incorporated into the creation of each circle homesite. Architects and builders from the earliest times have incorporated the soft, inviting form of the sphere into arches, domes, and vaulted ceilings. In recent years, we have been prevented from adapting such forms to architectural expression by our small, conventional, rectangular lots. The twenty-first century inhabitants of Eaglecrest® may again find hexagons and domes to be well-suited to their lifestyle, particularly since these structures lend themselves so well to circle homesites in a mountain forest environment. The one-third acre homesite affords a private living space that should accommodate a wide variety of needs and tastes. A serendipitous result of the large number of small cul-de-sacs and private drives may be the formation of family, friend, or colleague "compounds," which may be a trend in information-age habitats.

The homesites may be ringed with paths and trails that wind through the woods and along the creeks, overlooking the Sierra vistas and the American River. This is the environment of the electronic "space traveler," who can experience his surroundings as a jogger, hiker, walker, bicycler, painter, photographer, star gazer, or nature lover. Homesites like this may be an initial step in an exploration of habitat that will ultimately lead to the development of an information-age sense of space.

The industrial paradigm conditioned us to become accustomed to segmented, sequential space. Thus, we are unprepared to operate at the enlarged capacity which information technology affords. The information paradigm requires us to function in surroundings that are simultaneous, unsegmented and instantaneous. We can expect a period of exploration and experimentation as the culture searches for a way to deal with the sense of simultaneous space in our habitat. The example

under review here is a prototype of a community working, playing, and living in simultaneous space.

2. *The Shift from Standard Time to Real Time*

Our perception of time as standard sequential intervals—the industrial paradigm—has significantly affected the process of planning and building our habitat. We continue to operate with industrial metaphors and paradigms although we are planning and producing a habitat that should serve future generations desirous of living productive lives in an information-rich age. The relativity of time has not influenced our planning and building processes in creating workplaces and dwelling places.

As we recognize the relativity of time, we also recognize that each era appears to give its stamp to time, and that prescriptive technology affects our perception of time more than we had thought possible. We may become more conscious of this time difference as we begin to leave the industrial age and cross into the information age. The industrial age reduced sun time to chronological units: work hours, work weeks, and time cards. Industrial technology also separated work space, living space, and leisure space, which gave rise to standard time. We are beginning to realize that this separation created a new time, connected by long lines: rails, telegraph and telephone wires, freeways, and queues. People of the industrial age experienced time as distance connected by long lines and the sum of sequential units required to get from place to place. Our sense of time involved segmented interchangeable parts. Everyone became industrialized workers, selling exchangeable hours and minutes, whether we were laborers or professionals. The over-riding cost question was: how much time will it take? The time question tended to shift our attention from quality to quantity.

The public school became a conditioning factory of young psyches. So important was impressing the new industrial society with standard time that the process was stretched over twelve or thirteen long years. Instilling a sense of timeliness was all-important for making future workers conform to the new linear segmented sense of time. Bells punctuated tasks to be completed *on time*. We became accustomed to alarm clocks, starting and quitting bells and whistles, passing and tardy bells, and noon lunch whistles from nearby factories.

It may be difficult for us, conditioned as we are to industrial standard time, to imagine what a revolution this imposition was. For centuries, however, the agricultural age had flourished with work, leisure and dwelling in the same space. The industrial age radically altered that space by significantly changing our meaning and sense of time. With an exaggerated sense of chronology or consecutive sequence in our

consciousness, the separation of work, leisure, and residence became possible and desirable.

The information age is already having a similar impact upon our perception of time. In the process, it is contributing to psychological and social stress in virtually every sector of our civilization. This is understandable; the interface between the past and the future always creates confusion and uncertainty until a significant portion of the new culture establishes a "beach-head" in the new space/time. The stresses decrease as the new age establishes comforting lifestyles, and the new shapes become familiar and meaningful.

The ancient Greeks apparently understood the varieties of time, since they had two words which highlight the difference. *Chronos*, which has dominated the industrial sense of time, identifies time as the mere passage of sequential intervals. *Kairos* means filled intervals, or fullness, or meaningful time. The concept of chronos is not strange to us. We talk about a "slow day," when very little of consequence occurred. "Humdrum," reminiscent of the incessant rhythmic beat counting the passage of intervals while pacing effort, vividly classifies mere chronological activity as monotonous and dull. As we enter the information age, instead of perceiving time as vapid, sequential intervals, we will pay closer attention to the richer significance of time, *kairos*.

The rising tide of information is making us sensitive to intervals that "explode" with power and energy. The *real* time of the information age is simultaneous, contemporaneous, and instantaneous. It is not a matter of simply keeping busy, which can lead to weariness from handling seemingly endless amounts of trivia and busy-work. We have long been aware of the difference between the mere lapse of time and time which is meaningful. Time appears to pass quickly when filled with moments of consequence, when, in and through the ordinariness of routine, people meet and events and objects become meaningful. The information revolution is enhancing our awareness of the disparity between *standard* time and *real* time in virtually every sector of our life. It is not only affecting our attitudes about work, school, and social life, it is also affecting where and how we wish to live.

Electronic technology, which compresses information physically and transports it at the speed of light, is a powerful metaphor. The industrial paradigm conditioned people to feel and think and behave as if they were interchangeable. The information revolution connects us with real time and carries us far beyond such a limiting conception. We are not mere machines, but enormously compact sources of information, knowledge, and wisdom.

As in all epochal interfaces, we experience conflict as our perception of time changes. New communities like Eaglecrest® are accommo-

dative responses as the culture shifts from standard time to real time. The immediacy of real time will have an even more far-reaching impact than the sense of time which previous epochs engendered to serve their technologies. The sun time and seasons of farmers and settlers represented a dramatic shift from the day and night of hunters and gatherers. The imposition of standard time upon sun time, giving all intervals a twenty-four hour uniformity, seemed revolutionary at its inception. Now real time relegates standard time to mechanical routine, as we accommodate ourselves to information saturation that obliterates time as distance, and transforms it to an instantaneous, simultaneous event. By providing Eaglecrest® with the capacity for state-of-the-art information access, and by utilizing a novel approach to open space and community planning, the developers display an awareness of the shift in the sense of time and its impact upon our working, leisure, and dwelling spaces, as well as an understanding of the role of habitat in facilitating and supporting a culture.

3. *Cheap Energy to Precious Energy*

The abundance of water, wind, wood, and fossil fuels during a time of modest population created a situation in which energy was relatively cheap. As industrialization expanded to most areas of the globe, both population and energy consumption exploded. Information regarding the limits of energy resources made us aware of the preciousness of this commodity. The knowledge of energy's limits and accelerating costs is reorganizing our priorities from fuel-efficient engines to climate-tight construction and the relocation of residence and work to milder climates. Just as prescriptive technology contributes to our appropriation of space and time, it also affects our valuation and employment of energy.

The new energy-consciousness has contributed to modifications in building codes to assure more efficiency in construction. Concerns about solar and wind space are modifying our zoning ordinances. When serious attention is given to the extent to which our transportation systems are actually used primarily for communication, the relative costs of a mile of fibre and a mile of freeway become critical. When the energy to transport information over fibre is compared with the energy required by these secondary systems, the latter appear highly inefficient. These and other factors are already contributing to a trend towards location-independence and efficiency of habitat.

The location of Eaglecrest® in the foothills of the Sierra Nevada provides a most energy-efficient environment. At an elevation of 2500 feet, it enjoys abundant rain fall, being just below the 4000 foot snow line; yet it also records on the average over 300 days of sunshine per

year. The natural precipitation and sunshine reduce needs for water
and energy. By maintaining natural landscaping and constructing active
and passive solar-efficient dwellings, the developers of Eaglecrest® con-
serve these precious resources. By providing electronic connections for
the homes, the developers further conserve energy by making it possi-
ble to communicate information over long distances without travel. In
the twenty-first century, when such location-independence will be com-
mon, the planners of communities will surely consider the factors of cli-
mate to be crucial in designing least-cost habitats.

II. SPECULATION ON INFORMATION HABITAT

A. HABITAT AS THE HINGE OF CULTURAL TRANSFORMATION

In every massive cultural shift, habitat responds first, and in the
most far-reaching ways. Since time is no longer associated with distance
in the information age, people can locate their habitat wherever they
want. The Eaglecrest® developers are aware of this impact of the new
time on habitat; they expect that significant numbers of people will rel-
ish the opportunity to live in a forest environment because they can si-
multaneously work electronically in that same setting. Imagine
stepping out of your home work station, which has access to every type
of interconnecting communications link possible, for a change of pace in
the forest environment. Given the present state of the art of electronic
technology, many types of work can be accomplished from home,
greatly reducing commuting time. With the emergence of electronic ro-
bots, it is conceivable that even manufacturing can be directed from
some home electronic work stations.

One should expect to find at Eaglecrest® conduits to accommodate
fibre optic paths to each circle homesite, making possible the most so-
phisticated telephone, computer, and interactive television systems.
The use of roads and freeways for conventional commuter traffic could
sharply change with the advent of such an electronic village. People
will have the choice of electronic travel for a wide variety of functions
and activities for which we customarily use fossil fuel: work, shopping,
education, conferences with friends and colleagues, games, the arts, en-
tertainment, traveling. Yet the electronic village® will not be a seden-
tary place. The space is itself an invitation to involvement with the
physical environment. We can also expect new forms of human inter-
action which communities like Eaglecrest® would facilitate.

Thus, nearly universal access to information stimulates the pros-
pects of location independence. While not all may elect to exercise this
freedom, those who do will contribute to the shaping of important new
lifestyles and living environments. New methods of conferencing, man-
aging, negotiating, and decision-making are developing, which enhance

the prospects of a networked habitat that fosters location independence. It is upon developments like these that cultural transformation turns. A habitat that facilitates these economic processes will be refined and replicated, as were the apartment, tract house and suburbs which served the industrial transformation.

In every transitional period, there is a casting about for appropriate form through adaptation and accommodation. Through experimentation, more supportive forms of habitat emerge and ultimately dominate. Since we are in such a transition period, attention will be given to those forms that appear to be most supportive and effective for the information-rich society. Location independence is an important trend to be understood as our culture is transformed.

B. The Promise of the Meeting Place

The machine-age mentality imposed by the industrial revolution has conditioned us to believe that widespread use of computers will turn all users into impersonal "androids." While it is true that some technologies may overpower our sense of self and relationships, the technology of the information revolution evokes a personal response, in contrast to the impersonal response of the industrial revolution. Machine technology makes us feel and act like machines. Communication technology calls forth communicative instincts. We tend to see ourselves in the image of our prescriptive technologies. Because of this conditioning, there is a time lag before we understand the meaning of a new technology, and a natural "xenophobic" response is common. Yet, as we enter the information age, pessimistic pronouncements that we are all becoming machines with the advent of the microcomputer in fact describe what the industrial age has already done to us!

Workers and consumers are realizing the enormous utility of information. Earlier technologies vastly increased access to the fertility of the soil and the productivity of machines, thereby increasing personal control over one's future. Similarly, electronic technology provides nearly universal access to the utility of information. The democratization of decisions affecting the future is valuable. Fertility, productivity, and utility are thus synonyms for the increasing universalization of choice and influence that individuals have in decisions affecting both personal and corporate futures.

Electronic technology accelerates information to the speed of light. It is increasingly difficult to restrict information access. The increase in information electronically confronting us has the effect of making interpersonal communication more direct. Our growing use of confrontational styles arises from the influence which this information explosion has on us, motivating us to move more quickly to the issues without the

usual visual or aural indicators. This more direct communication holds the promise of richer, more satisfying personal relationships. While earlier technologies tended to support our identity with the soil or machines—and our view of persons as objects—information technology supports our identity with other persons as subjects rather than objects. The developers of Eaglecrest® are applying this insight in the creation of the electronic village®.

Speculating on the impact that information technology will have upon our dwellings becomes most intriguing when we reflect on the processes of previous times. We tend to create our habitat after the objects that vitalize us. The hunter/gatherer identified with prey or fruit; his tent was fashioned of poles and skins or leaves. The farmer/settler identified with the soil; his hut was built from mud blocks or stone. The worker/consumer identified with the engines of production and built his house with 2x4's on sixteen inch centers with many standard, interchangeable parts. Man's domicile evolved from shelter to fortress to factory, reflecting his evolving self-image, and the function and influence of the prescriptive technology.

The communicator identifies with information. It is too early to clearly see the shape of domicile issuing from this fascination with information, but it is likely that our enchantment with information and the impulse to communicate with one another which follows will give shape to our future dwellings as meeting places. The randon contact which we currently have with others is consistent with the high turnover of relationships, as exemplified by the high divorce rate. The need for substantive information—or in this case, substantive relationships—and the concurrent need for supportive environments or meeting places is obvious. Authentic meeting, where personal self-disclosure releases us from stereotypical behavior and response, frees natural reservoirs of energy and creativity inherent in every individual.

The shape of our buildings memorializes what is of paramount importance to us in each era. In the past, it has been our citadels and towers, our basilicas and palaces, and our factories and skyscrapers; homes were merely incidental support. This was not out of character with the role of the prescriptive technologies of those times. Now information technology for the first time changes the focus from objects to subjects, from useful tools to useful information, from talking *about* things to communicating *with* persons. In the early stage of a new era, the remaining structures of the old culture provide the temporary basis for the emerging culture. So it is today. Most of our meeting places are the inherited structures of industrial society, designed to serve its needs as efficiently as possible. These structures are useful in the transition, and may well continue to function as modified institutions long after their original purpose is forgotten. As in previous eras, however, we should

expect creative forces to express what is of paramount significance to the information age in the creation of architecture. This architecture will mark our landscapes just as smokestacks and civic centers, citadels and towers have in the previous ages. Since the dwelling space in the age of information technology will be a meeting place and a vital center of communication, we can expect a much larger creative effort to focus on the planning and building of our homes than in previous times. Dwelling places will become more central to our lives as productive and creative communicators in the new information-rich society.

Electronic technology is greatly stimulating the communicating propensity. Communication and information have always been part of our culture, but they have served more subordinate roles. Now, with nearly universal access to information, communication and information emerge as dominant influences with unimaginable implications. They have generated the concept of Eaglecrest®, the "world's first electronic village®."

C. FACILITATING SOCIAL INTERACTION

To protect ourselves from the crush of humanity common to densely populated urban areas, we have developed an insulation of impersonality and anonymity—the application of objectivity for the existence of the self. It is not surprising, therefore, to hear predictions of loneliness for those choosing to live in rural environments and telecommute one or more days a week. In fact, the opposite may be true. As location independence encourages living in smaller communities, exurbanites may be pleasantly surprised at their rediscovery of neighborliness, cooperation, and mutual assistance common in rural villages. People may find the social and intellectual environment engendered in villages highly supportive of personal, social, and professional enrichment. The promise of working from home promotes both a more relaxed and leisurely lifestyle as well as a focus and intensity. These conditions contribute more to social interaction than the impersonal and anonymous existence of the city. Awareness of this fact by growing numbers of people is a contributing factor to the urban exodus that has been quietly proceeding for several years. Close scrutiny of the new rural communities reveals an indigenous rural life, juxtaposed with a location-independent urban lifestyle. Sophisticated urban culture is springing up in villages and hamlets, as the new immigrants bring their values, priorities, and practical skills to their new dwelling spaces. This development holds great promise for the emerging information society.

The new electronic hamlets will facilitate social interaction, personal enrichment, and career development probably through the following facilities:

The Community Center. It is quite likely that the new villages will provide community facilities for group and organizational meetings and conferences. With the increasing interest in fitness, it is also likely that facilities, equipment, and programs will be provided to improve physical fitness, personal nutrition and stress management. While these programs focus on individual requirements, they can occur in a supportive social environment where residents of the hamlet meet with each other or with persons of other communities. Personal and corporate well-being and health is an important part of the emerging lifestyles.

Telecommunications Center. A facility to support those persons whose occupations enable them to telecommute may be another part of the electronic village®. Reproduction, supplementary word processing, document production, facsimile transmission, telex, answering services, data banks, and other similar support functions would be available according to the needs of the residents. Conference room facilities and interactive teleconferencing capability could also be included. Mailing and other executive office services may also be provided, if needed, for the work station in the home.

These facilities would also increase the possibility of participative democracy among the electronic villagers whose homes are connected with telecommunications paths. Teleconferencing will enable the village board of directors in a planned development to communicate directly with residents, making use of interactive TV and microcomputers for village decision-making and forums. Electronic committee meetings would be possible, supporting a high level of participative democracy, not only for village action but also for other organizations and groups.

The residents may also choose to use common data banks, design software for their common use, and, through a village cable network, create their own TV programming for entertainment and education.

Persons involved with the information revolution tend to be self-starters, creators, and inventors. When these individuals are joined by the cooperative volunteerism that is fostered in a rural setting, there is great promise for these and other ingenius developments.

Telecommuting and Travel. With location independence, we can expect to see dramatic shifts in patterns of commuting and transportation of goods and services, as well as a significant increase in leisure and distant-business travel.

Persons who have elected to live in location-independent situations generally have a considerable history of travel, both for business and pleasure. Highly informed, decisive people are neither sedentary nor reclusive. Communication technology will greatly stimulate the impulse to travel, to explore and encounter other cultures that we have

come to know electronically. The capacity we have to "travel" electronically will excite a similar desire to travel in person.

Telecommuters arrange their work and schedule client meetings to correspond with their own personal cycles of energy and creativity. The electronic village® arises from an understanding of this more productive and useful lifestyle.

School and Village: Telecommunications and Microcomputers. In addition to the business, self-governance and leisure applications made possible by interactive electronics, the opportunities for education appear limitless. We have only begun to see the impact that electronics will have on all aspects of education. Children raised in a telecommuting home will have many advantages, not the least of which will be direct contact with their primary role models, their parents. In addition, these children will have access to hardware and software for both education and economic activity. The prospect of a learning center in the home, connected to other homes in an electronic village® and to other schools, greatly expands the teaching/learning opportunities.

Eaglecrest® is in a community where the School District recently took a major step to incorporate microcomputers in their teaching program. This was stimulated by grants from computer companies, and was supported by a high level of teacher and board of education interest. Some educators predict that with the proliferation of the microcomputer, most children entering kindergarten in the near future will have had "hands on" experience with microcomputers in their homes. Taken together, the access to electronic media centers at home and on campus, the possibility of interactive communication with other students on other campuses and homes in other communities, and the capability of students to develop their own software and TV program resources constitute a true revolution in teaching and learning. Communities like Eaglecrest® will form the foundation of the expansion of educational opportunity made possible by electronic technology. This electronic village® may become the prototype of the twenty-first century information society.

III. AN ELECTRONIC FUTURE FOR HOME AND VILLAGE NOW

A. THE INFORMATION HOME

This Article has focused on the effects of technology, particularly information technology, on our habitat—our work and home environments. As we analyze the effects of technology on our dwellings themselves, we first must recognize the distinction between the "smart" house and the information home or electronic cottage®. There has been a great deal of interest in applying computer technology to the opera-

tion and maintenance of the home. Computers may be used to operate lights, heating and air conditioning, security systems, drapes, screens and blinds, various appliances and robotic cleaning devices, and indoor and outdoor irrigation. Using computers, the smart house will assume many of the administrative functions of the domicile.

The information home, while it may perform many or all of the functions of the smart house, focuses upon telecommunications and media. It facilitates the transfer of information and services between the domicile, its village, and the world beyond. As a new center of information systems, an information house could utilize electronic mail, electronic bulletin, and electronic banking. It would electronically make reservations for travel and entertainment, as well as purchases and payments on bills. It could provide emergency access to paramedics, fire, and police services, and permit participation in social activities and village meetings. In addition, these information homes could process information received through radio, telephone, television, and teletext. While the smart house will add to the convenience of home maintenance, the information home will emerge as a vital center of information access and processing. Many functions that previously required travel or were location-dependent can now be accomplished in an information home.

With our increased awareness of the cost of energy and time, and with the increasing possibility of living anywhere we wish in our information homes, we can expect some new developments in domiciling. If people have more choice in location, we might expect longer residency. This, in turn, will have some effect upon design, with particular emphasis upon flexibility for changing uses. Builders, developers, lending institutions, and planning bodies all have a stake in such possible trends, and should be planning accordingly to accommodate such developments.

The useful life of a quality home built today will extend into the twenty-first century, when electronic telecomunications will be a central reality. The information home will be the center of an electronic network for domestic administration and communication, leisure, learning, and work activities. Telecommuting, telelearning, tele-entertaining, and teleshopping will be commonplace as our lifestyles accommodate information-age technology. Information technology affects the design, internal components for wiring and appliances, and space requirements of our homes. Thus, telecommunications systems and hardware, microcomputers and data, telephones and voice communication, television and video, together with their support networks, should now be considered appliances and utilities for new homes and subdivisions. Yet, while water, power, and sewage systems are required subdivision infrastructure, telecommunications for voice, data, image, and video continue to be optional. As an investment for both buyer and lender, a

home which is designed architecturally for information-age life styles and equipped for telecommunications capability is essential, whether or not the initial resident makes use of its electronic telecommunications capacity.

Presently, it is possible to identify at least four areas where the impact of telecommunications can be expected to increase: home administration and communications; learning and continuing education; creative leisure and entertainment; and careers and occupations in the home. The planning of new subdivisions and the design of new homes should take these factors into account during the early development process, and the hardware, software, and networking capability for each area should be provided.

Home building has been enormously conditioned by the industrial age paradigm. We have so internalized this paradigm that we are unaware of the degree to which it has inspired our domiciling space. Given the significance of the emerging information age, we need to reconsider the primary purpose of domiciling. When we reconsider dwelling space, we can identify at least four spaces derived from functions essential to information-age domiciling: a personal-social interactive space; an adult quarters; a work station; and a flexible space for the changing requirements of present and future occupants. The first of these might be termed a *great room*, architecturally and aesthetically designed to facilitate personal interactions and social activity, from media access and entertainment to food preparation and service. The second type of space is an *apartment* for adult retreat and renewal, with appropriate space for "apartness" and privacy so necessary for active adults. The third space might be called the *teleport* to emphasize the ability to work *from* home that electronics affords. This work space will facilitate productive activity by both its design and the hardware, software, and furnishings it provides. The fourth space is in many respects a bonus, for it affords the possibility of many additional spaces modified for changing needs and circumstances. It may be termed *flex-space*, for it would be adaptable over the useful life of the house for everything from children's quarters and guest rooms to rooms for hobbies, games, shops, and storage.

Information technology will offer us homes that are better dwelling spaces than the houses inspired by industrial technology. A home that supports its residents in this way will be essential during the information age. As a dwelling space the information home will have important effects upon lifestyles, workstyles, and leisure styles, as well as upon our general social, economic, and political life and institutions. Both the information home and the industrial home support a population that can function effectively in an age dominated by its respective technology. Land use and building policy, long dominated by the industrial

paradigm, must move expeditiously to reflect the information paradigm, which is radically different.

B.   THE ELECTRONIC VILLAGE®

In summary, the following general remarks about the impact of information technology upon our living environments may be made:

1.   Planning for new communities will be based on the information paradigm rather than the industrial paradigm. It will emphasize human interactions rather than mechanical objectivity. Juxtaposition of residential, commercial, and industrial space will be appreciated, not avoided. Our residence will become more than just a place where we receive mail, sleep, and eat; rather it will be a dwelling space, a concept which will permeate the entire planning process.

2.   The infrastructure of our communities will include conduits with the capacity to send voice, data, image, and video transmissions within the subdivision as well as within the home along present and future telecommunications paths.

3.   Our new communities will be smaller, and will have the capability of an "electronic village® network."

4.   Facilities and capability for "common village services," available on a subscription basis, will be important.

5.   The means for interactive visual, voice, and data communication with a village board of directors will increase our sense of self-determination. Instantaneous and nearly universal access to information will result in a greater demand for a participative democracy, which the technology will be able to support on a village scale.

6.   Systems will be designed to anticipate state-of-the-art developments, and will include functions for entertainment, education, career, home administration, and communication. Systems will be planned with an awareness that the hamlet is part of a global village with global information access and distribution, and that the villagers are far better informed than even a half generation ago.

Undoubtedly, there will be other factors that need to be considered in planning and developing villages and hamlets for an information-rich society. In addition, millions of existing residences and communities will need to be retrofitted for the new information-age technology.

C.   THE ELECTRONIC VILLAGE® AS NEW SPACE

Conventional wisdom understands space as a constant. Yet by studying the interface between eras, we learn that our awareness of, appropriation of, and participation in space is heavily conditioned by our technology. Comparing the ancient seer's climb to the top of a hill to study the heavens and detect the oncoming storm with the contempo-

rary news weather satellite report viewed by millions, we begin to appreciate the impact our technology has upon our sense of space. Every new era has its explorers of the new space, in vastly increasing numbers. Today, for example, we explore *with* the astronauts through telecommuting in a manner incomparable with our passive appreciation of the story of the adventurer returning from his travels.

As earlier technologies created for their eras an enlarged awareness of space, so our information technology generates greater spatial needs. The people of Eaglecrest® strongly affirm the "electric surround" that is speeding up time, refocusing and concentrating space, and changing our energy priorities. This electric intensity generates greater spatial needs for healthy living and a sense of well-being. Intelligent planning for human habitat means a fresh look at residential, work, and recreational space. This principle contributed significantly to the creation of Eaglecrest®.