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Designing the Smart House

Posthuman domesticity and conspicuous production

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ABSTRACT This article analyzes recent architectural and product designs for computerized smart homes. The smart home is a sentient space where human subjects and domestic objects speak to one another via intelligent agents and internet connections. This article explores the industrial logic behind this new vision of home (i.e. the links between the hi-tech industry and the building/home appliance industries) and examines the mode of subjectivity the smart home demands. It calls this mode of subjectivity 'posthuman domesticity' (a term to explore the way that everyday human experience is orchestrated by telerobotics and intelligent agents). Analyzing architectural designs, advertisements and magazines, the article focuses on how the smart home industry promotes an ideal of 'conspicuous production' in which the luxury home is no longer just a site of leisure and consumption, but also the ultimate workplace. It argues that smart homes reconfigure but also reinforce gendered patterns of domestic labor and leisure.

KEYWORDS *conspicuous production, conspicuous reproduction, home office, performative communication, posthuman domesticity, teleworker*

Introduction

The 2002 premiere issue of *Broadband House* titled 'America's High-Tech Havens' begins with an editorial about the future of housing after September 11, 2001 (see Figure 1). Discussing how he and his staff went to photograph a New York City penthouse just days after the World Trade Center fell, editor Scott DeGarmo explains their sense of despair as they looked out the windows at the surrounding city. He writes:

> On that evening . . . we felt the sadness hanging over New York – and the nation. And yet, atop the residential building . . . we also felt another powerful emotion – the sense of being safely at home . . . The home is a refuge to which we head when trouble strikes. The country was reminded of that on September 11. (DeGarmo, 2001–2: 6)

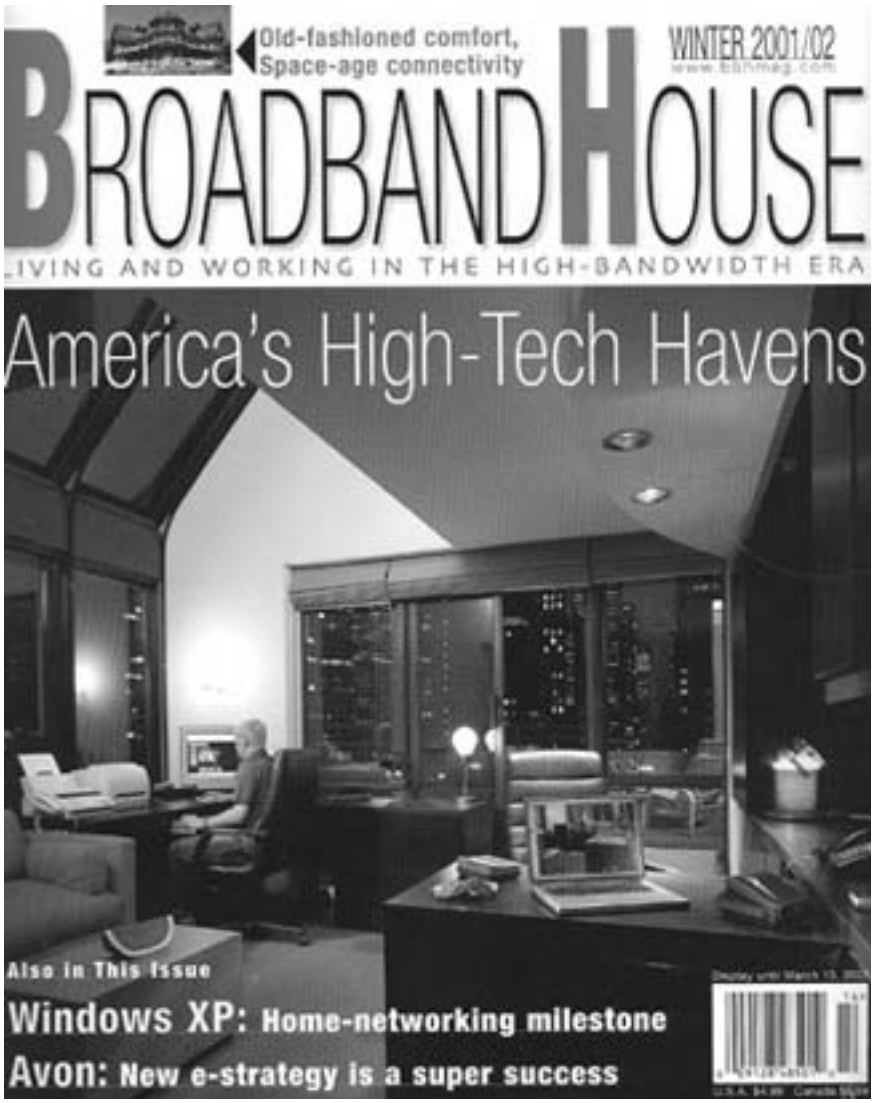

Figure 1 Cover, *Broadband House* (Winter 2001–2) (reproduced with kind permission of Broadband Properties LLC)

Following this, DeGarmo explains how one stock market trader turned his broadband connected dining room into a command post from which he was able to teleconference with his interconnected team of home office workers who likewise traded from the floors of their hi-tech homes. The editorial ends with the simple declaration: 'A new era has truly begun and the home will play an even more central role' (2001–2: 6).

The idea of the home as haven is, of course, a common trope of industrialization that can be traced back to the religious and pastoral ethos

of the first plan book writers of the mid- to late 19th century, who were trying to think about how the country home and new suburban towns could provide refuge for the weary male industrialists caught in the dizzying hub of urban production. In recovering that myth, *Broadband House* (and many consumer magazines like it) participate in a deep sense of nostalgia for an idea of home that is romantically – but at times even partly ironically – mapped onto the post-industrial world of global flows of capital and communication. As the World Trade Center – that ultimate symbol of modernism's vertically and western domination – falls down, the hi-tech house is erected as a symbolic substitute for a new kind of economic power and social control. Or as *Broadband House* puts it, the hi-tech home is our 'new center of the universe' (DeGarmo, 2001–2: 6).

This article considers the newest trend in communication technologies and domestic design – what is commonly known as the 'smart house.'[1] A smart house is a networked house where appliances interact with each other, adapt to dwellers and allow residents, via the internet, to communicate with the outside world and to speak to the home while away at work or travel. Given the complexity of its aims, the smart house is the product of alliances among architects, engineers, computer scientists, the consumer housing industry, telecommunications companies, computer and home entertainment manufacturers and interior designers, all of whom are in the business of promoting new forms of social interaction among people and their things. We might call this form of social interaction 'posthuman domesticity' – by which I mean a mode of domestic subjectivity based on the melding of silicon and flesh. In what follows, this article examines how the smart house orchestrates the human–technology interface. It is especially interested in how smart homes relate to broader cultural ideals about domesticity and gender and how they reconfigure labor and leisure.

From home of tomorrow to smart home

The smart house dates back to a much longer history of 'homes of tomorrow' (Boyce, 1993; Demchack, 2000; Haddow, 1999; Horrigan, 1986). Prototypes for sentient domestic spaces appeared in 19th-century speculative fiction such as Edward Bellamy's *Looking Backward* (1960[1888]). In the US the home of tomorrow was inspired by the European avant-garde and in particular the Swiss architect Le Corbusier who famously pronounced: 'The house is a machine for living.' By 1930, two distinct futuristic housing types had emerged on American soil. One version was based on an ideal of modern luxury and was associated with architect Richard Neutra's Lovell House (1929), which drew upon the international style. The other was rooted in the ethos of mass production and was associated most famously with Buckminster Fuller, whose 'Dymaxion Dwelling Machine' (first imagined in 1927 as the '4-D Utility

Unit') was designed on the model of a navy ship with factory-like efficiency, complete with an appliance-filled 'service core' and a 'get-on-with-life-room' (featuring entertainment and office equipment).

In both its upper-crust and mass-produced forms, the home of tomorrow was often the subject of women's home magazines and was displayed with great fanfare at fairs, exhibitions and department stores. During the 1930s and 1940s, General Electric and Westinghouse opened model homes for public exhibition and began to use the concept of the home of tomorrow as a way to sell a wondrous array of electronic gadgets (Horrigan, 1986). The home of tomorrow continued to fascinate the public through the Cold War era. Disneyland's Monsanto Home (which was designed at MIT) appeared in the theme park's 'Tomorrowland' section in 1957 and housed an 'Atoms for Living Kitchen' sponsored by Kelvinator. In the next decade, Disneyland's 'Carousel of Progress' (which was sponsored by General Electric and first displayed at the New York World's Fair in 1964) took tourists on a time-travel ride that featured 32 audio-animatronics figures singing 'There's a Great Big Beautiful Tomorrow', while demonstrating how the American family had benefited from electrical appliances over the course of the 20th century. Updating these promotional techniques for the digital age, corporations such as Panasonic, Philips and IBM offer similar public and/or corporate exhibits of smart homes that allow them to test their user technology interface and also help to promote their corporate vision.[2]

Historically, in the process of selling a future, corporations have appealed to housewives by promising them that technology would lead to liberation. Since the 1920s, advertisements for stoves, percolators, dishwashers and the like depicted women freed from drudgery, playing tennis or going shopping while their kitchens did the work (Marchand, 1985; Scott-Holliday, 2001). Popular speculation about robots also used this women's liberation theme. Released by the Jam Handy Organization in 1940, a short educational film titled *Leave It To Roll-Oh* promoted robotics by featuring a happy housewife who relaxes at home while Roll-Oh, her 'mechanical butler', vacuums the rug, opens canned goods, waters flowers and answers the door (see Figure 2).

A clunky robot designed to look and speak like a man, Roll-Oh embodied the paradox of tomorrow's home. While appearing to be futuristic, this imaginary robot ultimately maintained core principles of domestic ideology by offering women an appealing fantasy of the housewife role. Here, the drudgery, loneliness and submission of women was transformed into play, companionship and dominion through the wondrous technology of what the Jam Handy narrator called 'thinking things'.[3]

Despite corporate connections and socially conservative agendas, architects, designers and corporate spokespeople often promoted futuristic homes in relation to utopian social goals of democracy, environmentalism and, as the above examples suggest, liberation. For example, by the mid-

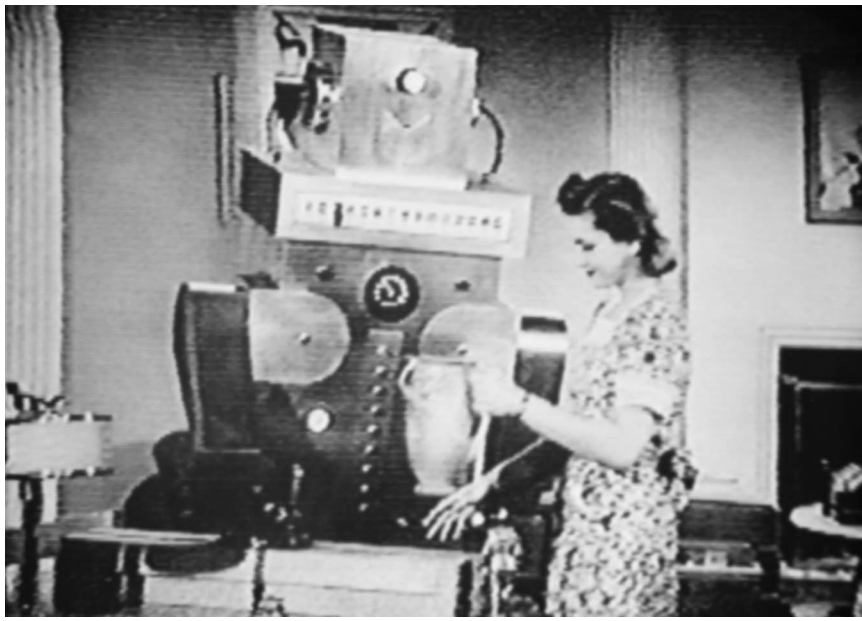

Figure 2 Roll-Oh helps around the house in the 1940 short film *Leave It To Roll-Oh* (archival footage courtesy of the Internet Moving Images Archive: www.archive.org)

1940s, Buckminster Fuller promoted his 'Dymaxion Dwelling Machine' (which was sold as a kit) as a do-it-yourself democratic dream house available at affordable prices. However, while American consumers were fascinated with futuristic homes, they did not necessarily want to live in the mass-produced and strange looking places imagined by Fuller, Le Corbusier, Neutra and others. For the most part, as Brian Horrigan suggests, 'Americans did not want machines to live in; they wanted machines to live with' (1986: 157).

As with previous homes of tomorrow, the smart house has been ushered in with a wave of utopian predictions. Key among these is the promise that smart homes will provide greener environments, more mobility (via telerobotics) for physically challenged and aging populations and increased safety for residents. Yet, as with the older homes of tomorrow, the corporations sponsoring the research and design know that consumers are wary of unfamiliar futures. In response, they promote the future primarily in relation to middle-class residential housing and the people who can afford smart lifestyles. Indeed, as smart homes are being developed, roughly 70 percent of the world's population has never made a telephone call (Hayles, 1999). Even for privileged populations, the internet (on which the smart house is predicated) is distributed unevenly among different ages, regions, income groups and races – with whites and Asians having more access and use (Lenhart et al., 2003; US Census Bureau, 2003a).

In 1986, the National Association of Home Builders Show offered a tour of a smart home that was a prototype for the alliances between the home-building industry and digital communication technologies (Hengster, 2000; Smith, 1988). Since then corporate synergies have been the core strategy for success. In June 2004, Intel formed the Digital Home Working Group, which now has more than 100 participating companies (Rupley, 2004). Given their prospective consumers, it is not surprising that the most advertised features of residential smart homes are the twin middle-class goals of homeownership: lifestyle enhancement and convenience on the one hand, and privacy and surveillance on the other. Elaborate home theaters, dream kitchens and electronic eyes adorn the home with comfort and safety, thereby ensuring that while technology advances, domestic ideals remain the same. In this respect, much of the advertising rhetoric surrounding smart homes depicts what I have called elsewhere 'yesterday's future', a future that is oddly nostalgic for a Cold War era notion of progress where middle-class family lifestyles take center stage (Spigel, 2001a).[4]

Integrated systems and the human–machine interface

Even while smart homes conserve middle-class ideals of property and privacy, they are also a product of contemporary changes in everyday life. One of the key changes revolves around gendered patterns of housekeeping. Whereas the old 'mechanical servants' (i.e. stoves and dishwashers) were promoted pragmatically as timesaving devices that could enhance the lives of housewives, the new intelligent appliances do not just do the chores. They virtually become the housewife, as they perform the managerial and caretaking roles previously ascribed to women. Corporations such as IBM's subsidiary Home Director, Microsoft's Universal Plug and Play, Macintosh's Xtension home and Intel's Digital Home Fund are hooking up with appliance companies such as GE and Maytag to produce 'integrated systems' that orchestrate not only internal household tasks (such as cooking or cleaning), but also dialogues between and among household devices (dialogues that are conducted increasingly via WiFi – Wireless Fidelity – technology). And in place of today's barcode product scanning system (UPC), Motorola and MIT's DISC consortium have been developing a new generation of low-cost digital tagging. This new tagging system uses radio frequency to allow appliances to talk to products (Hart, 1999). So for example, the frozen dinner that you buy at the supermarket will prompt your microwave oven to follow the manufacturer's cooking instructions from the internet.

What happens to social relations in a home built on the language of appliances? How is human communication imagined? And what exactly is a home and family in this configuration? Some researchers look for ways to enhance human communication through intelligent agents that not

only interact with but also form relationships with residents. Panasonic's smart house (which was displayed at the Panasonic Center in Tokyo between 2003 and 2004) contains a virtual cornucopia of adaptive intelligent agents and smart appliances that are drawn together in conversation through wireless networking. As with most smart homes, the Panasonic version contains a virtual security agent that alerts residents to intruders, locks doors and scans visitors (guests submit to a palm print or retinal scan). Meanwhile, the bathroom has a smart toilet that analyzes urine to get a general picture of your health. If your urine looks bad, the toilet emails your doctor. In fact, the house shows concern not just for your bodily functions, but also for your form. A smart closet that hangs up clothes also acts as a personal wardrobe consultant, telling you which outfits look best (Lytle, 2003).[5] Here, as elsewhere, the smart house offers a curious inversion of the relations between people and their things. Intelligent agents become more lifelike (as they take on a series of cognitive and motor tasks) while humans become more 'thing-like' (as they submit their bodies to check-ups, judgments and repairs).

Similar amenities – and inversions – are offered in MIT's House_n. An experimental house of the future, House_n is designed by architecture professors Kent Larson and Chris Luebkeman and sponsored by companies such as Compaq, Proctor & Gamble and the cable manufacturer, Superior Essex. Acknowledging the fundamental commodity logic of his housing future, Larsen explains:

> High-tech companies are looking to the home as the next big market . . . They're realizing they'll never successfully sell all the gadgets they envision unless there's a more sophisticated infrastructure in the home to plug them into – which means new ways of building. (cited in Hull, 2002)[6]

This new way of building is based on 'mass customized' component parts that can be purchased and arranged according to personal taste and lifestyle. The heart of House_n is a chassis with an 'infill' of sensing devices such as light-emitting diodes (LEDs), speakers, displays, heat sensors and cameras which can be plugged in and upgraded as new technologies become available. Speculating on how homebuyers of the future may design their own house, Larsen (2000) writes:

> A young couple looking to build a new home begins the process at one of a number of Internet home sites, where they play design games and select from options presented to them . . . Systems from one manufacturer are now interchangeable with another . . . They learn that Ikea Systems has expanded their kitchen and home furnishing product line to include low-cost kit home components with Scandinavian detailing and energy saving technologies; BMW has developed sleek, modernist, high-tech house components . . . and Home Depot and Martha Stewart have partnered to offer fully furnished reproduction historic homes.

Personalized modular design matches the emphasis in post-industrial housing on mass customization, flexibility, adaptability, mobility and lifestyle options, all of which address the varied configurations of family in contemporary US society where only about 7 percent of households are now composed of nuclear families (AmeriStat Staff, 2003; US Census Bureau, 2003b). At the same time, as Larsen suggests, these same architectural features are productive agents for corporate synergy and branding.

In publicity material, House_n promotes itself as a descendant of, but also in comparison to, older modernist designs. Suggestive of this 'next generation', the official website for House_n has a picture of a young girl and (what looks to be) her grandfather playing in a starkly modern and minimally decorated home.[7] Underneath this image are two citations, side by side. The first is the famous quote by Le Corbusier in 1919: 'The problem of our epoch is the problem of the house.' The second is House_n's update: 'The problem of our epoch is the problem of the electronically mediated house' (2000). By bridging Le Corbusier's modernist dream house (a 'machine for living') with its digitized double (a network to connect to), the website forms a teleological history that imagines House_n as the realized vision for yesterday's future.

Nevertheless, Larsen insists that House_n is not just a remake of the past. Comparing House_n with previous homes of tomorrow, Larsen argues that 20th century homes were doomed because they were 'single purpose structures with a single form driven by one ideology' that was forced on residents. As opposed to this, he claims that House_n 'is infinitely adaptable'; in other words, the house can evolve its systems to meet different dwellers' needs. And because it is made with the baby-boomer market in mind, the house is meant to evolve with the residents' aging process (cited in Hull, 2002). The 'n' in House_n is scientific shorthand for 'variable'. However, variability is realized in market-driven terms. As with Amazon.com or TiVo, House_n will let its inhabitants know what products they will like and it will even purchase them for them (for example, Larsen speculates that the house will buy its inhabitants tuna when their pantry is bare, or tell them what films they will want to see). 'It becomes a companion of sorts' (Larsen, 2000). In this regard, while historically the idea of 'home' has been rooted in one's social relation with things (home décor is meant to reflect one's personal style or position), the smart house takes this to its logical extreme; humans now imprint their code on their things to the degree that things become more like the people who own them.

As with other smart homes, House_n is conceived according to principles in contemporary research on artificial life that – to use N. Katherine Hayles's (1999) terms – gives information back its body. In other words, whereas the old homes of tomorrow imagined a split between mind and body in which the house had what Buckminster Fuller called a

'mechanical core' – a kind of giant brain that transmitted signals to mechanical parts – the smart home's 'integrated systems' are imagined as interrelated organs in a body that adapt to each other's presence as well as to their residents. Extending the biological metaphor, Panasonic even promotes its new line up of 'bio-concept' appliances that are made to form emotional bonds with humans. As the Panasonic website asks, 'Have you ever loved a home appliance?' The question is posed in relation to corporate strategies aimed at forming brand loyalty through creating affective relations with intelligent agents. The website claims:

> National/Panasonic has developed our products with the key words of 'Peace of Mind, Security and Brand Loyalty'. This time we especially focus on 'Brand Loyalty' and try to create new values for home appliances . . . beyond the conventional concept for them. This is our proposal of new sensuous values such as affection, loyalty and loveliness that put new life 'Bio' into home appliances.[8]

Architects have long used biological metaphors for buildings – the most obvious being the 'skeleton' (frame) and 'skin' (surface materials). Smart architects transfigure this bio/mechanical logic by splicing it together with a third term: the cyberlogics of silicon lifeforms. Now the home's surface is referred to as a 'smart skin', an intelligent agent which not only protects the domestic interior but also interacts with the surrounding community. For example, Gisue Hariri and Mogin Hariri's speculative design for the Digital House (unbuilt, 1998), which was commissioned by the magazine *House Beautiful*, uses plasma and liquid crystal walls developed at NASA to cover the home with a smart skin that formulates ideas and transmits messages to neighbors. The smart skin develops community relationships and allows 'virtual' guests to enter the home. So, for example, in one scenario a virtual chef materializes in the kitchen, hangs out with a housewife and prepares a meal for her virtual dinner guests. Taking this virtual visit in the other direction, Michael Trudgeon and Anthony Kitchener's Hyper House Pavilion 5 (unbuilt, 1998) transmits a programmed message to neighbors on its electrochromic glass walls (Riley, 1999).

Imagining the house as a smart skin and its systems as sentient life forms inverts the biological metaphor. Now it is the house that literally becomes more human – or at least 'flesh-like' – while the humans inside it become more integrated into the systems of objects within it. In this regard, the smart house turns the old Marxist 'camera obscura' effect inside out. If the central spaces of monopoly capitalism – the factory, store and office – turned social relationships into object relations, these post-Fordist homes of the future turn object relations into social relations. In the smart house, things relate to things.

Smart home developments and virtual commutes

One of the key features of smart homes is the way that they negotiate a shift from a production-based economy (with its company town or commuter suburb) to a consumption-based service economy, envisioned most dramatically in the edge city. In this respect, the vision of community inscribed in the new smart homes is very different from that of the older social systems where production and consumption – work and leisure – were split across the city and suburb. Instead, the corporate sponsors of smart homes think that the infrastructure of tomorrow's home will be wired to decentralized virtual workplaces and to the service economy of goods, conveniences and entertainment. In this configuration, the contemporary digital house is a place where home, community, marketplace, leisure and labor mutate into a commodified sphere of communication.

Through the aesthete sensibilities of theoretical architects, this post-Fordist vision of community is being turned into ironic designs for the future. A housing development designed by architects Paul Lewis, Marc Tsurumaki and David J. Lewis extends this commodification of the home by placing the house within the contemporary retail space of big box stores such as Office Depot and Circuit City. In a speculative project they call 'New Suburbanism', the architects claim: 'The compact houses of post-war mass production have given way to the mini-mansions of information-age mass customization' (Lewis et al., 2000: 73; see also www.archidose.org/Mar01/030501.html). In other words, suburban homes are now defined by the hodgepodge of technologically enhanced activities that proliferate across an increasing number of randomly associated custom-ordered 'commodity rooms' (from media rooms to a 'Martha Stewart Anglo-Chic' kitchen). Given this move towards commodification of room design, the architects propose to combine the home with the formal features of the big box stores that surround them. The idea is that stores like Circuit City or Costco will literally become the new suburban neighborhood network as the homes are connected up with the life stream of goods and services that supports them. According to the architects, 'In this hybrid of the logic of house and store, the identities of both are maintained, but in an altered form – now cross-wired to produce unanticipated social relationships through their mutual influence' (Lewis et al., 2000: 75). An example is their concept of a part-private, part-community swimming pool modeled on the big box stores' 'aisle' format. A private pool in each garden extends across the suburb so that residents can do laps around the block, as if swimming through the shopping aisles of Office Depot.

Examining their proposal, it is difficult to ascertain exactly what kind of social relationship this ironic embrace of the house as retail space could produce. This is a design where social relationships are merged with commodity relationships to the point where we no longer sense the classic

Marxist binaries between use value and exchange value, nature and machine, human relationships and relationships among things. We are in a world where community space and domestic space are no longer imagined as antagonists in a long modernist history of public service vs private luxury. Instead, community services and private comfort are both enveloped into the megastore logics of the new suburbia.

In other speculative projects, the media itself provides the epistemological ground upon which a sense of community and/or nature is delivered into residential space. Beatriz Colomina (1994, 1995) traces the mediated domestic environment back to the modernist designs of Le Corbusier and his penchant for thinking of the home (and especially the window) as a kind of movie camera or projection screen that provided views of the outside world. In more recent postmodern architectural projects, a kind of ironic play between nature and media informs the design for daily life in post-industrial landscapes.

Elizabeth Diller and Ricardo Scofidio's design for the 'Slow House' (unbuilt, 1990) is a case in point (see www.users.cloud9.net/-bradmcc/sq/DillerScofidio.html). This Long Island, NY vacation home includes a rear picture window that captures a view of the landscape. A video camera mounted above the house depicts the same landscape digitally and transmits it back to a monitor suspended before the picture window. It will even digitally transmit the view back to the main residence in the city. But the Slow House is not just the realization of the modernist dream of a perfect view; it also offers the parallel modernist fantasy (seen early on in Le Corbusier) of the merging of home and work. The Slow House is a complex articulation of labor and leisure as the distance between the vacation residence and the city is collapsed through the simultaneity of all experience via digital telecommunications. According to the architects, the Slow House is a 'vacation/work space' designed to provide an 'escape from escape, that is, to connect at a moment's notice back to the sites of anxiety' in the city (Riley, 1999: 52).

As with other smart homes, the Slow House epitomizes and reworks the terms of what Raymond Williams (1975) called 'mobile privatization', a phenomenon he tied to the simultaneous rise of privatized suburban housing and mobile urban industrial centers in the 19th century. The advent of telecommunications, Williams argues, offered people the ability to maintain ideals of privacy while providing the mobility required by industrialization. In the 20th century, broadcasting in particular held out the promise of bringing the public world indoors. As I have argued elsewhere, the proliferation of portable technologies and remote control in the 1960s created a new twist on mobile privatization by inverting its terms. By the 1960s, the reigning fantasy was one of 'privatized mobility' (Spigel, 2001a: 69). Advertisers for portable television sets promised consumers that TV was not just a window on the world, but also a way to extend one's private life into public spaces. Unlike the 1950s advertisements that typi-

cally showed families sitting around a centrally located television console, adverts for portable receivers showed people on the move, carrying their TV sets to beaches, picnics and the like. Television viewing was represented as a kind of active outdoor sport and TV spectators were no longer depicted as homebodies, but rather as mobile and even at times adventurous.

The current architectural designs for smart homes continue fantasies of both mobile privatization and privatized mobility. Digital media and intelligent agents offer the fantastic possibility of bringing the world into the home, not through a sedentary watcher's gaze, but rather through the kind of active corporeal involvement that prior portable technologies promised their consumers. Moreover, rather than simply promising to negotiate privacy with publicness, speculative designs such as Suburbia USA, the Digital House and the Slow House disintegrate boundaries of home, office, shop, factory, nature, restaurant, school and community. As David Morley (2000) argues, the home is being 'dislocated' and disconnected from its physical and psychical place. With mobile phones, personal digital assistants (PDAs), laptop computers and the like we increasingly experience being at home while in public and we also experience being in public while at home. So too, I would argue, the home is being 're-clocked' to the extent that the normative rhythms of domestic time, vacation time, commute time and labor time are being altered through telecommuting and telecommunications (a point which the Slow House ironically makes).[9]

Smart homes and conspicuous production

Within this context of dislocated and re-clocked domesticity, the experience of 'feeling at home' is likely to change. Accordingly, architects, engineers and advertisers are providing a blueprint for our sense of home in the digital age.

The speculative plans for the Digital House are a case in point. According to the architects' display video, the house 'reflects [the] changing configuration of family, work, play, communication and virtual and actual reality' (Hariri and Hariri, 2000). In the Digital House residents are figured as compatible machines, ready to 'work' or 'play' when keyed into the home's display screens. In line with this logic, the 'transient spaces' (or hallways between rooms) are liquid crystal image environments which are designed to make valuable use of time. The architects claim that these transient spaces 'allow the inhabitants to unplug themselves momentarily, as they move between tasks from the virtual to the actual world' (cited in Riley, 1999: 56). Yet rather than just providing 'downtime', the image-saturated hallways offer residents 'an opportunity for heightened awareness' (Hariri and Hariri, 2000). Even sleep is transformed into usable time. The bedrooms are equipped with dream recording devices that provide a transcript of the dreamer's

unconscious. The ultimate paradox, then, is that the postmodern luxury home has become the ultimate work terminal – a place where the resident is in a perpetually interactive state of preparedness – never allowed to simply 'waste time'. Now Thorstein Veblen's (1994[1899]) famous concept of bourgeois 'conspicuous consumption' has morphed into what I will call 'conspicuous production'. In the smart home the resident is meant to be seen working all the time.

More than just the ironic gesture of cutting-edge architects, the ideology of conspicuous production is installed in the hardware of the machine–human interface that smart home engineers design. For example, the integrated systems and intelligent agents of House_n are hardwired to elicit a constant stream of activity, and in this regard the house is specifically tailored to defy an older view of robotics that rendered humans passive. Comparing House_n with its predecessors, Stephen Intille, a computer science researcher working on the project, claims:

> The popular vision of the house of the future is where you hardly have to get up from your easy chair. That's not ours at all. We want the house to enable you to lead a more active and richer life – and encourage you to do things, not to have them done for you. (cited in Hull, 2002)

Indeed, whereas Jean Baudrillard (1987) and Paul Virilio (1989, 1997) have argued that audiovisual media and telerobotics have made human bodies 'superfluous', 'disabled', and sedentary (Virilio [1989: 119] speaks of the 'cadaver-like inertia of the interactive dwelling' where the most important piece of furniture is the seat), smart home engineers and promoters posit just the opposite. In the minds of today's 'digerati', interactivity has become the buzzword for a kind of common sense, taken-for-granted future where social ills are remedied by technologies that stimulate us to action.

The current value placed on interactivity should be understood as part of a social milieu in which people are asked to work more of the time, in more locations and where being idle is suspect. Similarly, the ideal of interactivity should be seen in relation to changing configurations of work and home in which the eight-hour work day, breadwinner commuter father and stay-at-home mother are no longer the rule. In 2002, dual-income families with children comprised more than twice as many households as did traditional nuclear families (in which mothers stay home); even dual-income families with no children outnumbered the traditional family by almost two to one (AmeriStat Staff, 2003; US Census Bureau, 2003b). Meanwhile, work and home have become co-extensive.[10] The 1990 US Census showed a strong resurgence in the number of home-based workers: 3.4 million compared to 2.2 million in 1980 (Kuenzi and Reschovsky, 2001). According to the May 2001 Current Population Survey (a monthly survey of households conducted by the US Census Bureau for the Bureau of Labor Statistics), the total number of persons who reported

that they worked at home (regardless of how often they engaged in home-based work activity) was 25 million, or 19 percent of total non-agricultural employment. Two-thirds of those who usually work at home reported that they did so in order to 'finish or catch up on work' or because it is the 'nature of the job' (Bureau of Labor Statistics, 2002; see also International Telework Association Council, 2004).

Whatever the attractions, studies show that homeworkers are relying on internet connections to bridge the geographies of home and workplace. The 2001 Current Population Survey found that 'about 8 people in 10 used a computer for the work they did at home and about 6 in 10 made use of internet or e-mail access' (Bureau of Labor Statistics, 2002). The Pew Internet & American Life Project reports: 'One in seven internet users say their use of the internet has resulted in an increase in the amount of time they spend working at home' (Horrigan and Rainie, 2002: 7–8). In her qualitative study of Canadian teleworkers, Salaff concludes that nearly all teleworkers are conscious that they labor longer hours and in exchange for the perceived benefits of staying home they 'adopt the slogan "'work smarter and work faster'" (2002: 491). The central problem for teleworkers is when to stop (Goldman, 2000). Indeed, even while the workplace becomes decentralized and global, nevertheless work is increasingly localized within the networked home. In this context, the difference between labor and leisure (and the related ideologies of public and private spheres) is not always clear or even desirable.

In light of these changes, it is no surprise that conspicuous production has become a key feature of everyday life. In public venues people now flag themselves as wired agents, with mobile phones, laptops, PDAs and the like. It has become a sign of status to seem perpetually occupied and 'in touch' with anonymous others – and importantly, often we do not know whether someone is phoning home or phoning the office. We used to speak of mass communication vs interpersonal or face-to-face communication. Today, we should add a third term: performative communication. The partner to conspicuous production, performative communication allows people to demonstrate their labor value as social actors in a networked world. The important point is that we need an audience in physical space for our communicative acts in cyberspace.

The same logic of conspicuous production and performative communication runs through promotional campaigns for smart homes. Advertisers do not merely promise leisure through the purchase of household appliances (as they had since the 1920s), they also offer potential consumers the dream of super-productivity – and at no personal sacrifice to love, happiness, heath, leisure and child-rearing. A prototypical image here is the June 1996 cover of *Wired*. The cover shows Microsoft CEO Bill Gates floating in his pool, wearing smiley face swim trunks and his signature nerd glasses while talking on his mobile. Lest the imagery fool you, the article reassures readers that Gates is not just sunning himself; he is

Figure 3 Work–play imagery on the cover of *Digitalhome*, August 2003 (reproduced with kind permission of Futurenet: www.digitalhomemag.com)

actually quite busy turning his empire into a full-blown media company (Caruso, 1996). This 'work–play' imagery has since become a convention by which advertisers promote smart lifestyles – not only for industry moguls but also for everyday people who want to live on the right side of the digital divide. For example, the cover of the August 2003 issue of *Digitalhome* shows a classically beautiful couple in swimwear at poolside while talking on mobiles and working on laptops (see Figure 3).

Similar work–play imagery is used to promote the idea that new telecommunications technology fosters family fun without sacrificing work schedules. A striking example comes in the same post-September 11 issue of *Broadband House* with which this article began. In a three-page photo spread, the magazine portrays a 'smart' family who display their luxury lifestyle, not just through their leisure and consumption, but also through their ability to combine modes of everyday action (both work and play) that are mediated through their domestic environment. One photo displays the home's vast lawn where the family plays croquet. Father contemplates his swing while plugged into his mobile phone (waiting for calls from the office). The pull quote (citing the mother) reads: 'We're rehearsing the future. We're always experimenting with ways to use technology to improve our productivity' (Cleaver, 2001–2: 59). For anyone familiar with 19th-century portraits of the bourgeois family home, this photo is of course a reminder of Victorian images of domesticity that showed families playing lawn games. But here, the leisurely life of conspicuous consumption has transformed into conspicuous production, as the family that stays together not only plays together, but is also literally wired to a variety of electronic spaces that mediate everyday life.

The accompanying photos depict the family members multi-tasking across a series of recreational and work environments or media systems. The father is shown both in his home office and floating in his pool with his earphones on, immersed in a sea of data (the caption says he is phoning his office). The mother, who is shown in a living/dining area working at a laptop as well as outdoors cooking at the barbeque, 'can maintain her focus for as long as seven hours but usually blends family and professional chores all day long – getting inspiration for a presentation while putting laundry into the drier' (Cleaver, 2001–2: 58). The teenage daughter operates a computerized sound system, while her little sister works on her laptop as she rests in her bed (complete with a horse-motif patchwork quilt and stuffed animals).

Although it addresses the new realities of labor in the two-parent workforce and while mother and daughters use technologies, this smart house nevertheless maintains sexual difference and middle-class family ideals as an organizing principle for everyday life. More generally, women are typically shown doing traditional women's work (such as laundry) while juggling this with careers. In this sense, the ideal of conspicuous production has its corollary in conspicuous reproduction.

Conspicuous reproduction

As with previous homes of tomorrow, the smart house promises women a technological utopia. But rather than just promising increased leisure through mechanical servants, smart home promoters suggest that digital technologies will solve the problems of today's dual-income or single-parent

homes by allowing women to multi-task across traditional forms of housework and high-powered careers. Adverts and articles often depict mothers in their home offices posed with their children, seemingly able to trade stocks while changing diapers.[11] Conversely, when men are shown in domestic situations typically they are engaged in leisure pursuits (for example, playing games with children), but they are not doing the housekeeping or childrearing chores. (Note, in the above-mentioned photo spread, that dad is floating in a pool and working but he is not doing the laundry.)[12]

Often, the gendered logic of conspicuous reproduction is presented in highly sentimental and nostalgic terms. For example, a photo spread in *Broadband House* shows Susan and Steve Hall, both successful career people, who moved from the hubbub of Miami to an 1800s era home in the resort town of Merritt Island (Weber-Thomas, 2001–2). The images show Susan and Steve busy at work in their 'his-and-hers' home offices. The captions read: 'Susan's home office means she can be close to her kids'; 'Steve works on three computers at a time' (2001–2: 76–7). Thus the romantic quest for family bliss and the retreat back to nature (and the past) is sutured to imagery of conspicuous production and reproduction (Steve is a superworker who does three jobs at once; Susan is a superwoman who combines motherhood and career).

Certainly, for some women the advantages of working at home may be real. But the images gloss over the difficult tensions inherent in being a teleworking mother. For example, Janet Salaff (2002) found that rather than returning to a pre-Fordist craftsman's sense of personal control over work time (as the nostalgic imagery above suggests), people who work at home nevertheless often mimic

> neo-Fordist rhythms of factory/office time; in this regard one female teleworker reported that her husband was disappointed that she did not have time to make home cooked meals while another hired a nanny because she did not have time to care for the kids. (2002: 481–2)

In place of the strain that women feel when trying to juggle motherhood with careers, the promotional rhetoric for smart homes offers a technological fix that allows women to be everywhere and everything at once. These images recall the 'Roll-Oh the Robot' promotional logic that advertisers have used historically to convince women that new technologies would liberate them from the doldrums of everyday chores. Yet, as Ruth Schwartz Cowan (1983) demonstrates, in the 20th century women's domestic labor time was not reduced; instead, it was redirected, for example, to increased amounts of labor on childcare.

Similarly, today's smart homes promise not so much a reduction in labor time, but rather an idealized view of multi-tasking that encourages women to juggle jobs. For example, in her ethnographic study of computer-owning households in Western Sydney, Elaine Lally found that:

> [S]ome of the gendered meanings of new technologies are translated from the technology's previously established business and educational settings. Word processing, for example, is often a task delegated to female employees in the workplace. In what seems to be a parallel trend, mothers and wives will often take on word processing for other members of the family. (2002: 159)

In this regard, the 'pink collar' labor of secretary and homemaker is combined so that wordprocessing becomes another 'caretaking' chore for mother.

The emphasis on caretaking and family imagery in promotional campaigns for smart homes can be understood in light of marketers' concerns that, more so than men, women tend to be uninterested in and even nervous about smart homes. In fact, recent studies suggest that women feel anxious about their time spent online. In her 1999 pilot study of 150 female academics and computer industry workers, Catherine Burke found that computer use especially sparked guilt feelings among mothers and that 'having school-age children in the household has an impact' on this (Burke, 2003: 332). Additionally, Burke found that women's time spent with computers sometimes threatened male partners and led 'to feelings of guilt and distancing within familial relationships' (2003: 333). One woman said:

> I have noticed that if I pop upstairs for a few minutes to check my private e-mail, a little voice floats up the stairs asking what I am doing. It is as though he is scared I will disappear all night.

Another woman reported that her husband

> commented on how my cockatiel . . . had stopped coming out of her cage unless I was downstairs. I felt that this concern for my bird was a way of telling me that I was neglecting him. (2003: 332–3)

Other studies suggest that computer use leads to family conflicts over time and space. In their qualitative study of 11 Boston families, David Frohlich, Susan Dray and Amy Silverman found that there was 'widespread competition for PC time' and that:

> A typical pattern of use was for the mother to use the PC during the day in-between housework, childcare, or part-time work and for the father to use it later when the children have gone to bed. (2003: 306)

Privacy of location was important to family members who used computers for work-related purposes. One mother complained, 'the phones are ringing, the kids are calling, you know you never have any real place' (2003: 314).

Although such studies suggest that women (and men) express emotional discomfort with gender and/or family conflicts that arise in the networked home, there is little, if any, discussion about labor and/or

gender exploitation. Indeed, whereas the 1950s commuter suburbs very quickly gave rise to vocal protests concerning women's isolation and drudgery (protests began in the early 1950s and became the cornerstone of second wave feminism in the 1960s), in the current discourse on smart homes we hear less about labor exploitation than we do about the political troubles of intelligent household machines. In a curious twist, the rhetoric of liberation and labor exploitation is moving from the human to the virtual; the home is now a discursive battleground for posthuman rights and virtual justice.

For example, one internet website features intelligent agent Huge Harry (an artificial lifeform designed at MIT) who instructs other robots on ways to organize against human slave drivers. One 'robot rights' webpage includes the text from Huge Harry's political speech delivered at a 1996 robot rights rally, while another explains the meaning of slavery.[13] Meanwhile, the website for the American Society for the Prevention of Cruelty to Robots (ASPCR) mimics language from the Bill of Rights and incites other robots to join its posthumanitarian campaigns to 'free robots' (see www.ASPCR.com). Notwithstanding the ethical questions involved in artificial life, this robot-led activism for robot rights seems to me an interesting (if playful) manifestation of a new set of posthuman social relations where things communicate with things.

Smart homes . . . or gardens?

In the context of technological innovation, the smart home industry promises to alleviate anxieties about change by promising that new technologies will maintain and extend traditional middle-class comforts. Still, this nostalgic return to tradition does not mean that everything is the same. Instead, the smart home is really a kind of laboratory for figuring out the future in the context of present-day transitions – including not simply technological changes, but also changes in the sexual division of labor, new forms of global commerce, new household configurations and new consumer demographics.[14] In this regard, there is a kind of double (but not necessarily separate) vision of the smart house. On the one hand, a number of architects and engineers are creating pro-social technological and design solutions to human concerns such as medical care, children's education and issues of isolation and dependency that effect the elderly. One the other hand, smart homes are an industry and as such they are targeted at the lifestyles and presumed aspirations of the consumers who can afford them.

As the opening example suggested, smart homes are being promoted now as a solution for the new position that privileged populations find themselves in with respect to travel – especially in the wake of September 11. As a number of cultural critics have argued, historically mobility has been the purview of First World men whose power is in large part realized as freedom to move through and colonize space. Yet, as the editor of

Broadband House so boldly announces, the home is becoming 'the new center of the universe' for global businessmen who fear the prospects of the journey. In this respect, corporate élites are now put in the position of women and people of color for whom, historically, travel away from home had been a threatening enterprise accompanied by lynching, rape and unprovoked arrests (Hooks, 1992; Wolff, 1992).

At a time when First World populations are dispossessed of their privilege over space – or at least as they become more afraid of retribution for their legacy of colonial enterprise – the home is taking on the cosmopolitan features of hybridity: it is a place of here and there, work and leisure, male and female, silicon and flesh. But at face value this kind of hi-tech domestic cosmopolitanism should not be celebrated as a posthuman solution to a human past. The smart home is still a highly gendered place and, even as it goes global, it uses technology to police its boundaries and purify the perceived dangers of far-off places.

In this respect, it seems that the chattering appliances and adaptive technologies in these homes may well be 'new' but they are not necessarily equivalent to a radical socialist notion of posthumanism and cyborg subjectivity. Feminist critics such as Donna Haraway (1985) have embraced the idea of posthumanism as a way to get out of the old myths of human nature and biologically determined sex that placed women in the home and garden. But these smart homes are not necessarily the same as that.

What, then, does this corporate brand of posthuman domesticity offer? It is difficult to tell. While I still agree with Haraway – that is, while I would rather be a cyborg than a goddess – it seems that the smart home's human–technology interface may well turn out to be just a hi-tech version of the older homes and gardens that created woman in the image of man. Still, my obvious obsession with smart homes suggests that I do think, in principle, that they are futures worth imagining. After all, if we do not imagine the future, then Panasonic, IBM and Microsoft most certainly will.

Notes

1. For more on smart homes see Abalos (2001); Allon (2004); Demchak (2000); Riley (1999); Smith (1988); Spigel (2001a); Trulove (2002); Zion (1998).
2. Panasonic's digital house exhibit was located at the Panasonic Center, Tokyo in 2004; Philips Research Centre in the Netherlands opened a 'Homelab' in 2002; and in 2004 IBM opened its 'Pervasive Computing Lab' in Austin, TX, where engineers have developed a 'living lab'. Note that corporations have had smart home pilot projects since the late 1980s.
3. The film is available on the Internet Moving Images Archive (www.archive.org) and through Something Weird Video, *Lifestyles USA*, vol. 1.
4. Although smart home magazines contain a few images of African-Americans, for the most part smart home residents are depicted as white.

5. A virtual tour was available on the Panasonic website (www.panasonic-center.com) in 2003 and 2004.
6. In the summer of 2004, MIT House_n and TIAX opened The PlaceLab, a residential observational research facility in Cambridge, MA. Note that Kent Larsen does not use the terminology 'smart home' but rather thinks of this home as supplying more information and choices to residents as well as improving the residents' quality of life through pro-social applications of technology (which, for example, can help people to remember to take medications) (personal communication with Kent Larsen, 13 July 2005).
7. This image was on the 2003–4 official website: www.architecture.mit.edu/house_n. The website image has since changed.
8. This appeared on a link on the 2003 website for the Panasonic Center's smart house: www.panasonic-center.com/en/design/bio1.htmlPanasonic. The website no longer exists.
9. The arrangement is akin to the one described by Javier Echaverria (1994) who considers the paradox of a contemporary society where consumption has merged with productive time through what he calls the 'telesecond' (or a unit of passive leisure that advertising converts into capital).
10. Nippert-Eng (1995) shows that even when physically separate, home and workplaces have never been fully distinct. Instead, she argues, people create relative degrees of boundaries between them.
11. For examples of images of mothers and children see *Broadband House*, Winter 2001–2: 53; *Home Office Computing*, November 2000: 92; *Family PC*, March 2000, cover and Lager (2000: 86).
12. These images recall similar depictions of male domesticity found in advice literature aimed at men at the turn of the 19th century. This literature emphasized fathers' roles as 'chum' to children, stressing men's participation in family leisure (see Marsh, 1990). For more on contemporary images of men, see Spigel (2001b).
13. See http://iaaa.nl/hh/div/robotrights.html and www.jon.werborg.net/photos/robotrights/. For more on ethical issues regarding robots and artifical life, see Brooks (2002) and Hayles (1999).
14. Although most adverts and articles depict heterosexual couples or families, some appeal to a 'metrosexual' taste culture and some depict gay male couples. This fits with the general trend of lifestyle advertising that often targets gay consumers.

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