

**Designing technology for domestic spaces:  
A Kitchen Manifesto <sup>1</sup>**

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Jenny Nelson (Doris Day): “Oh boy! This kitchen doesn’t need a woman!”  
Bruce Templeton (Rod Taylor): “Jenny, you’re the one good thing in this kitchen I didn’t make provision for.”

*Glass Bottom Boat* (Tashlin 1966)

*Glass Bottom Boat* is one of those Hollywood movies – ditzy blonde disrupts the orderly life of rational scientist. Bruce Templeton, a NASA physicist, played by Rod Taylor, has designed himself the perfect home, instrumented with labor saving devices. His kitchen is a showpiece of streamlined functionality. Cooking becomes just another task, one that can be controlled, contained and automated with appliances popping out of counter tops and self-cleaning dishes and floors. This kitchen confounds Doris Day’s character, renders her feminine skills obsolete, and she is compelled to declare that there is no place for her in this kitchen of the future. The declaration that “this kitchen doesn’t need a woman” aptly captures a theme that reverberates through this paper. In creating technology for the home, in particular for the kitchen, technologists have forgotten that

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<sup>1</sup> This paper began as a hyperbolic conversation at MIT’s Media Lab in Boston. A flurry of emails followed but the paper was written in two co-present moments. The first draft, fueled by “Vietnamese coffee”, was written over two nights in the middle of a Boston summer. The second draft was composed at a series of café tables in and around Dublin, and in the hop-rich scent of the Media Lab Europe’s new facility in the old Guinness Brewery’s Hop Store. We hope that this paper represents another way of thinking about collaborations between the Media Lab and Intel, which is one of its corporate sponsors, and more broadly for ways to work within and between research institutions and industry. Of course, this paper would not have been possible without the support of our respective institutions and colleagues, both local and digitally diasporic, and we thank them all. We are also grateful to a number of researchers around the world working on their own smart homes, and in particular want to thank Thad Starner (Georgia Tech) and Michael Lye (Rhode Island School of Design) for their prompt responses to requests for additional information and helpful references. We also thank Darra Goldstein for her initial encouragement and continuing interest. Jofish would like to thank Julie Fresina for introducing him to *Glass Bottom Boat*.

these domestic spaces are inhabited and used by people; that they function not as sites for technologies' in(ter)vention but as sites where meaning and meals are produced.

Bruce Templeton's special home offers one representation of the 20<sup>th</sup> century's preoccupation with automating and optimizing the domestic sphere, but the "home of the future" has always had a certain seductive appeal to both Hollywood and industry. In this paper, we want to excavate the futurist home, making clear the connections between this vision of the domestic, and discourses of modernity, as well as tracing its connections to the "smart house."<sup>2</sup> Throughout this paper, we attempt to draw a critical distinction between "house" and "home". People inhabit homes; technology powers houses. Coward provocatively suggests a similar distinction in her essay *Ideal Homes*, a critical essay in which she discussed representations of home improvement in magazines such as the *British Ideal Homes Magazine*:

In spite of the offer of an intimate glimpse into a private home, all traces of life in that home tend in fact to be obliterated. The owners are evicted by the photographic regime. The house is photographed as it probably never is – tidy, sparkling clean, free of persons and their ephemera. These are not *homes* but *houses*. They are the finished products, the end of the long years of planning or 'loving restoration'. These are the houses that exist in the imagination during the years of painting, scrubbing and hammering... To represent a lived-in home would destroy for ever more the illusion that a house could ever be finished and perfect. (Coward 1985, 65-66)

Our focus is technology, not interior decorating, but the point that houses of the future exist only in the imagination is a strong one. We propose unpacking the imagining of the smart house, and create a context and genealogy within which current and past research can be made intelligible.

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<sup>2</sup> This notion of excavation owes much to Foucault (1972), cultural studies (Davis 1992), and to recent methodological interventions in anthropology (Marcus 1996, Miller 1999).

The trajectory from the display houses of tomorrow to the current narratives about smart homes is one that ultimately conflates the domestic with the industrial, and leaves little room to imagine real lives within those engineered confines. The “smart kitchen” is, in turn, embedded within the smart house and also presupposes a digital lifestyle. However, we argue that in order to get it right, to create spaces and technologies that people will want to use, not just admire from a distance, you need to disarticulate the domestic from the digital. One way to do this involves complicating our understanding of the kitchen, moving beyond seeing it as a collection of wires, appliances and internet points, to thinking about it as a space in which people really live.

As researchers working at sites of technology production and innovation – Intel Corporation and MIT’s Media Lab – we find ourselves increasingly preoccupied with the question of how you design, not for efficiency, but for experience, affect and desire (Bell 1998, 2000, Kaye 2001). The challenge is to make sense of people’s daily practices in such a way as to meaningfully inform design and innovation. Although many technologies have now migrated from the office to the home, the underlying notions about how these should operate have not undergone similar shifts. With the notable exception of the television, which is profoundly home grown, most new domestic technologies embody notions of **efficiency** – designed to deliver better time and resource management.

## **I. From the houses of tomorrow to the smart home: the domestic sphere on display**

The house of tomorrow is an exhibition house. It was designed to demonstrate mechanical equipment and new building materials that are now on the market. The house of tomorrow is an efficiently designed house. The chief concern of the architect was not to give a specific form to his building, but rather to find a solution to the many and varied new requirements of a residence in a simple and direct manner. The causes were considered first, the effects later. He started from the inside and worked out.

George Keck

“The House of Tomorrow” at the Century of Progress International Exposition, Chicago, 1939 (Jandl 1991:31)

The Crystal Palace Exhibition of 1851 feted the achievements of British industrialism. It also launched a new era of ‘expositions’ in the US and Europe that would forever conflate science, technology, progress and the spectacle. Throughout the latter years of the nineteenth and the early years of the twentieth century, expositions celebrated the marvels of engineering – the steam engine, the safety elevator, photography, the telegraph, the internal combustion engine, radio, the phonograph, motion pictures. During Chicago’s World Fair, the Columbian Exposition of 1893, domestic science and home economics were articulated as new academic disciplines in the United States, bringing the domestic sphere into prominence as a celebrated site of technology intervention and invention (Banta 1993). At first, the domestic appeared only in the form of new labor saving appliances. Gradually, these appliances were embedded within domestic settings, with the home first materializing as a painted backdrop and then, slowly, taking more solid form.

By 1939, George Keck’s design for a house of tomorrow was a fully-fledged and recognizable dwelling. Keck’s newly modernized dwelling was featured in the Century of Progress International Exposition in Chicago and confirmed the domestic as a site for

technological intervention, in the form of efficient design.<sup>3</sup> The redesigning of British homes in the early 20<sup>th</sup> century, rather than emphasizing efficiency, was concerned with “notions of adaptability, mobility and change,” mapping onto powerful utopian ideals of the day (Attfield 1999: 73). Commencing with post-war reconstruction in the 1920s, but peaking after World War II, the British home underwent a significant transformation that culminated in an open plan interior. This new open plan design attempted to create “the optimum conditions with regard to quantity and quality of fresh air, sunlight, and proximity to nature” (1999: 75). And while efficiency was part of the new plan, far more important were the attempts to rewrite social conventions – doing away with the hierarchy of rooms that had segregated class and gender to create mass housing in high-density urban areas. By contrast, the emphasis in the United States was on the development of suburban single-family and privately owned homes. To understand how ‘efficiency’ became such a key factor in the American “house of tomorrow,” one needs to look to the impact of Frederick Winslow Taylor on American industry.

In his remarkable biography of Frederick Winslow Taylor, Robert Kanigel makes a compelling argument for the relatively recent appearance of efficiency within American history. He writes that it was not until the late 1910s, after the publication of Taylor’s *Principles of Scientific Management* (1911), that American began to encode efficiency as a relevant metric in getting things done. In the nearly ninety years since then, efficiency

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<sup>3</sup> Keck’s house, and four others from the Century of Progress Exposition, are currently the focus of preservation efforts (Sharoff 2000). Relocated to the Indiana Dunes National Lakeshore in the late 1930s, they have languished in disrepair for some 60 years. In 1999, a partnership between Indiana Dunes and the Historica Landmark Foundation of Indiana, put the houses on the market – offering them for private occupancy and purchase in return for promises to restore them appropriately.

has been so naturalized as to be almost invisible – its logic so entrenched in our culture that we have a hard time identifying its impact.

Taylor's thinking ... so permeates the soil of modern life we no longer realize it's there. It has become, as Edward Eyre Hunt, an aide to future President Herbert Hoover, could grandly declaim in 1924, "part of our moral inheritance" ... Taylor bequeathed a clockwork world of tasks timed to the hundredth of a minute, of standardized factories, machines, women and men. He helped instill in us the fierce, unholy obsession with time, order, productivity, and efficiency that marks our age ... Taylor left a distinctive mark on American life and the world ... he quickened the tempo of our lives, left us more nervous, speedy, irritable ... all concur that if we obsessively value time, jealously guard what we have of it, and contrive to use it 'efficiently,' we must look to Taylor for the reasons why. (Kanigel 1997:7)

It is worth noting here that while Japanese industry borrowed heavily on Taylorist principles, it found less traction in Europe. This has allowed for a degree of slippage between technology and efficiency unimaginable in the United States. In this interstice, design that follows form as much as function has flourished, accounting for the current prominence of design in the European appliance industry, as compared the American.

In the United States, Taylor's impact on manufacturing and industry is arguably unparalleled. His influence extended into the design of appliances and the architecture of the home (Lupton and Abbott Miller 1993), with domestic science owing much of its success in the 20<sup>th</sup> century to Taylorism and several of his energetic followers. Lillian Gilbreth, who was married to one of Frederick Taylor's closest collaborators, Frank Gilbreth, conducted some fascinating experiments in the kitchen in the late 1890s, eventually developing a floor plan for kitchen spaces she called 'continuous.' (Gilbreth 1928).

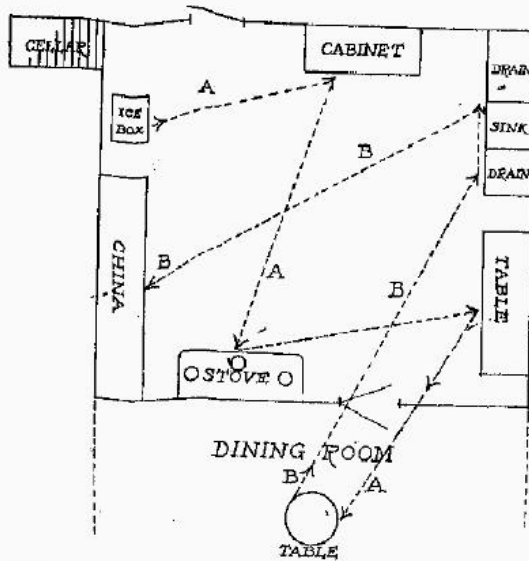


Diagram showing badly arranged equipment, which makes confused intersecting chains of steps, in either preparing or clearing away a meal. (A—preparing; B—clearing)

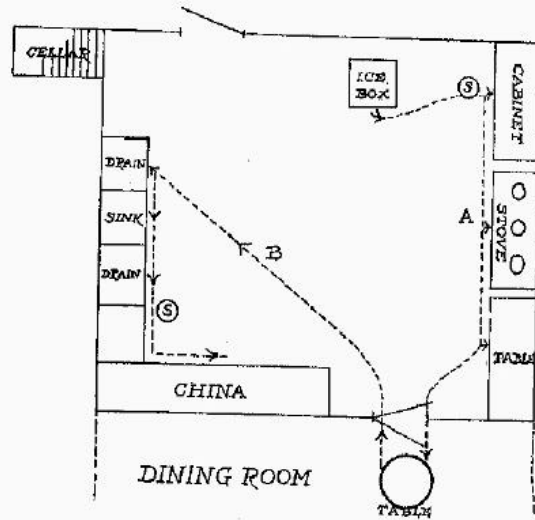


Diagram showing proper arrangement of equipment, which makes a simple chain of steps, in either preparing or clearing away a meal. (A—preparing; B—clearing)

#### From The New Housekeeping by Frederick I

These kitchen spaces minimized unnecessary motions and movements, but ultimately, and perhaps most importantly as respects this paper, allowed and encouraged customization and flexibility to the individual.

[She] recognised that there was more than one “correct” way of doing things, and their aim was to help people discover solutions that would suit their individual needs... Lillian Gilbreth’s flow process charts and micro-motion transfer sheets were intended to enable the housewife to organize the home according to *her own* work habits. She continually reminded her readers that there was no ideal solution; the height of a kitchen counter must be adjusted to the height of the person, and the most useful layout of appliances would vary from one household to the next. (Rybczynski 1986: 191)

One of Gilbreth’s colleagues and friends throughout this period was Christine Frederick. Together they worked on several projects around the electrification of the American kitchen. In the teens and twenties, Christine Frederick, capitalizing on Taylor’s expanding influence, called for the transformation of the home into a site of modern,

clean and hygienic, and above all efficient, production (Frederick 1914, 1920). Of the kitchen in particular, Frederick once wrote “It is the wrong idea that many women have of making their kitchens look like other rooms, with tools tucked out of sight. A kitchen is a workshop, where efficiency should rule over mere looks<sup>4</sup>” (1912:71). This positioning of the kitchen – as a workshop – is key to understanding the ways the domestic sphere was subsumed within the rubric of industrialization. What this did was bring the kitchen into public view and into the realm of technology intervention. Bringing the kitchen into the technological space meant an emphasis on the implementation and use of technology of the future, at the expense of supporting real people and real practices in the present. Indeed, in the phenomenon of display houses, or houses of tomorrow, kitchens became one of the key sites of innovation and development.

Unlike some of the other spaces and places that were transformed by Taylor’s zeal, the kitchen was the one most explicitly located within the particulars of a female gendered division of labor. The kitchen was a female space; in many ways, it still is.<sup>5</sup> In the 1910s and 1920s, suffragettes (and their friends Gilbreth and Frederick) advocated new technologies for the home, hoping that these might liberate women from the domestic round, allowing them access to the workplace or education. However, feminist scholars have long argued that labor saving devices did not have that affect. Indeed there is evidence to suggest that women spend just as much time engaged in domestic oriented

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<sup>4</sup> It is interesting to compare this vision to Martha Stewart’s vision of a seamless future kitchen, unencumbered by visible cupboards, tools, or even table legs. (Stewart 1996)



chores than they did 50 years ago (Cowan-Schwartz 1985, Robinson and Milkie 1999). So while many women are now wage earners, it seems that they still bear the brunt of housework (Oakley 1974, Schor 1993, Strausser 1982). When wives and mothers talk about technology for their kitchens, and use the language of efficiency and labor saving, it is then easy to read this at face value; to believe, as Strasser (1982:8) says, that “convenience constituted an end in itself.”. But under that evocation of Taylor, lies something more complicated. When women say “we want labor saving devices”, what they are actually saying is help us spend more time doing the things we want to do – whether that is being with family, watching television, or cooking. The movement for more efficient housekeeping came from a culture that assumed that the woman’s place was the home; the resulting efficiencies made it possible for women to start to free themselves from domestic isolation and drudgery.

### **Displaying the Home**

The Century of Progress exhibition of 1933 included the *Armco-Ferro Enamel House* and *The Masonite House*, and Monsanto’s *House of the Future* was a staple at Disneyland’s *Tomorrowland* for a decade starting from 1957. This shift from the emphasis on science and technology inherent in the Century of Progress exhibition to Disneyland’s spaces for entertainment and public consumption is indicative of the relationship between the house of the future and the media; today’s public’s perception of the future is more influenced by *Star Trek* and *The Jetsons* than any of the smart houses built anywhere.

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<sup>5</sup> The notion that the kitchen is a gendered zone is inherent even in the responses to Kaye’s current research; reporters frequently assume that as a technological male in a technological kitchen, he is pro-

Intrinsically, the house of the future was always on display – it inverted the traditional relationship between public and private, patifying private spaces to the public gaze. When displayed at World’s Fairs, Expos and Trade Shows, these vision houses were populated by models and actors, who animated otherwise semantically neutral spaces. The performance of domesticity that was meant to lend a degree of credibility to these vision houses merely reinforced their spectacle-like qualities – distancing the audience from their new homes. One of the many ironies here is that, while the houses of the future were designed for display as much habitation, the vision of lives in these homes was progressively more insular and isolating. (e.g. Davis 1990: 151-265) These houses were disconnected from a broader sense of community, both in their moments of display and in their implementation. The technology that they imagined promised a kind of island-like existence, where the family was sheltered from the world and all interactions beyond the home could and would be mediated through technology. It is no coincidence that much of the current popular media coverage of ‘smart homes’ is rife with anxieties about surveillance, privacy and security.

The ‘house of tomorrow’ is a vision perpetually deferred and one that tells us more about the preoccupations of the time than it does about the designs of the future. It is interesting then to reflect on the semantic shift that seems to have occurred within the last ten years: the language of houses of tomorrow has been replaced with talk of digital, or smart, houses. Articles on smart homes reference home automation, energy costs, interactive appliances, remote controlling, home networking, wireless devices, entertainment centers and security. As one commentator put it, the smart home is a “fully computerized

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technology, eats nothing but instant noodles and cannot cook. This is a matter of some distress to him.

household that serves and even anticipates your daily needs” (Doolittle 2000: 26). Taking a slightly different tack, the director of the Smart Homes Foundation in the Netherlands writes,

Smart home technology is the integration of technologies and services, applied to homes, flats, apartments and houses and small buildings with the purpose of automating them and obtaining an increased safety and security, comfort, communication and technical management. (Berlo 2000)

Whatever the exact spin, today’s smart house is predicated on seamless, pervasive, ubiquitous computing. The 1980s witnessed the whole-scale migration of personal computers from the office to the home. Initially, these PCs represented an extension of the office space (Venkatesh 1996). Due largely to the Internet – email, instant messaging, chat rooms, and the world wide web – the 1990s has seen the market for home PCs started to change, with consumers demanding machines and functionality that were better suited to their new domestic environments (Bell 2000). The current trend in the United States at least, is to always-on broadband technology within the home. Early reporting on the adoption of broadband in the US and UK shows that these newly enabled devices are promptly moved from office-like spaces to highly trafficked spaces within the home, principally the kitchen table. The power of the Internet carries forward Taylor’s primes of efficiency to a new century, with talk of zero-friction business models and optimal pricing algorithms.

### **Smart Houses & Smart Homes: Corporate Research<sup>6</sup>**

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<sup>6</sup> For an exhaustive list, albeit slightly outdate, of future computing environments with a focus on smart homes, see: [www.cc.gatech.edu/fce/seminar/fa98-info/smart\\_homes.html](http://www.cc.gatech.edu/fce/seminar/fa98-info/smart_homes.html)

In today's corporate settings, smart houses spaces recall the houses of future, in both sensibilities and rhetoric. These are not spaces one can easily imagine inhabiting. They remain stages for performances, rather than spaces for lives. They are also, for the most part, concerned with advancing their brand or industry, without necessarily creating a coherent vision for the future. In the United States and elsewhere, corporations have taken a variety of approaches to address this problem, ranging from creating their own buildings dedicated to their corporate agenda and sponsorship or outright purchase of academic research. Academic institutions too have sought ways to create spaces for research and design – collaborating with industry partners and seeking funding from non-profits

Most industry and academic ventures can be mapped on to a continuum from smart houses to smart homes. Exemplifying the corporate smart house is the Australian-based Copper Development Center, with emphasis on infrastructure not daily activities. In a recently built display home in Kellyville, in the Sydney suburbs, a technology-independent wiring system is key – one that can support telecommunications, security, audio, lighting and gardening. CEO of Copper Development, John Fennel, says, “Smart Wired Houses are a technological evolution that would enable new homebuilders to ‘future proof’ their homes” (Copper Development Center 1999). One can only marvel at the irony of a smart home that must itself be future proofed.

For appliance companies, the smart home space provides an appropriate venue to showcase new devices and new visions. Siemen's *Smart Home* in Milan boasts “a

glimpse of how fashionable and effortless living can be in the 21<sup>st</sup> century” (Siemens 1999). Furthermore, their website proclaims,

The kitchen is the heart of any home, and needs to be beautiful, inviting and full of the best appliances that money can buy ... And the coffee-making machine is tantalising. Whether it's an espresso, cappuccino or plain filter you prefer, all you need do is touch the FingerTIP sensor, and the Biometric Coffee Machine will know exactly the coffee you want and make it just how you like it. (Siemens 1999)<sup>7</sup>

Here the emphasis is on a lifestyle not a life. For Matsushita Electrical Industrial, the manufacturer behind such brand names as Panasonic, Technics, Quasar and National, the emphasis is also on lifestyle – “Internet Lifestyle.”<sup>8</sup> In 1999, Matsushita built its own state-of-the-art model home in Tokyo. The “Home Information Infrastructure” (HII) house blends digital technology and consumer electronics (Kakuchi 2000) and is currently featured on Matsushita’s Japanese website, as part of the *Exhibition of Dream Technologies for the 21<sup>st</sup> Century* (Panasonic 1999). The website has its own future family of cartooned characters, whose styling seems to owe a great deal to the *Jetsons*. The son, a young blonde boy, has a speech bubble over his head, declaring “Let’s have fun with digital technologies!” and his mother, also blonde and decked out in an apron, pearls and heels announces, “Our lifestyle will be changed by digital technology in the future.” (*ibid*). The HII kitchen display space is all gleaming white, with frosted green

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<sup>7</sup> One cannot help but be reminded here of Douglas Adam’s own version of this machine – the Nutri-Matic that produces, on request, “a liquid that was almost, but not quite, entirely unlike tea.” Of course, that technology responded to natural language, providing seamless, albeit imperfect, service and required the computing power of an entire spaceship to produce one pot of Early Grey tea (Adams 1980). Kaye admits a similar scale of guilt to produce a cup of espresso. (Kaye & Matsakis 1999)

<sup>8</sup> As the flurry of interest and accompanying speculation in the economic potential of the smart home grows, there have been a number of interesting corporate partnerships and strategic alliances. In October of 2000, MEL joined together with 3Com, BestBuy, Cisco Systems, CompUSA, General Motors, Honeywell, Invensys, Motorola, New Power Company, Sears, Roebuck and Co and Sun Microsystems to found the Internet Home Alliance. This alliance agreed to work together to “advance the home technology industry by developing the ecosystem to support the delivery of Internet lifestyle solutions and educating consumers on the value of an Internet lifestyle” (Panasonic 2000). There are a variety of other alliances, all extremely similar to the outside observer.

backlighting, and is described as “an entirely new kind of kitchen” (*ibid*). It boasts a home information terminal and a central control for appliances including the networked electronic microwave oven (that retrieves various recipes through the internet), the fridge and the air-conditioner. Here technology is the driving force.

Philips Design, the design arm of the European consumer appliance manufacturer, offers a very different take on the smart home, suggesting instead a “house of the near future” (Phillips, 1999 a).<sup>9</sup> Unlike many other designed smart home spaces, Philips pays attention to the notion that people live in and have lives in domestic spaces. Their 1999 travelling exhibition – *la casa prossima futura* – is underwritten by the belief that “the home of the future will look more like the home of the past than the home of today” (*ibid*). In describing their vision of future domestic ecologies, Philips’ website suggests that:

The Home of the Near Future will contain intelligent objects which can learn to behave in ways that fit our lives – that get to know our home environment, our relationships, our rituals of everyday activities. The ‘smart’ objects, as well as the physical structure of the home, will contain and development an intelligence which is designed to learn, anticipate and provide for our needs. Products will resemble familiar objects and furniture, with a greater relevance and significance to our home life than the ‘black boxes’ of today. (Philips 1999 b)

Designing for specific ecologies, and relationships within the home, Philips demarcates a list of specific domestic environments: the living room, kids room, home office, bathroom, kitchen, dining room and bedroom. Philips’ near future kitchen will contain:

The latest technologies that allow hands-free food preparation, internet browsing for recipes, electronic chief advice, fresh conservation of food, and instant analysis of the food’s composition, are embodied in objects

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<sup>9</sup> Mention that this came out of Mezziano(?) coming in to Philips Design and realizing that there was no shared or arguably existing corporate vision of the future.

that are anthropologically meaningful, such as an apron, scales, a glass toaster, etc. (Philips 1999 b)

Yet while their appliances delight with their playfulness, sincerity and novelty, the underlying assumption is still tinged with efficiency. They have developed a library of whimsical objects, but all politely recharge themselves, enable instant communication and avoid messiness in cooking in a perpetual striving for maximal effectiveness. The very concept of “hands-free food preparation” implies an emphasis on efficiency and minimizing mess; while *la casa*’s vision and scenarios are beautiful, it is much harder to imagine the actual user.

For high-technology companies, the smart home represents an important potential site for the consumption of computing power and Internet enabled experiences. Along with appliance manufacturers, and sometimes in alliances with them, they are exploring this domestic ecology.

Microsoft’s Easy Living project looks at intelligent environments; their work is primarily aimed at domestic spaces, although they’re not looking directly at the kitchen. Much of the work seems very technology-first, rather than human-first. (Brumitt et. al 200) although at least one of their studies (Brumitt & Cadiz 2000) is an very humanist evaluation of a human-computer interface for controlling lights in a future home of the future. We see Microsoft as an example of a company that is still primarily focused on business and industry applications of technology, and despite publicity the contrary, is still not focused on the home environment itself.

Intel's Architecture Lab (IAL), a research and development laboratory in Portland Oregon, has its own vision of the smart home space (IAL 2000 d). Unlike many high-technology companies, Intel is slowly recognising that the home is a distinct ecology, allowing that it is no longer enough to simply develop technology for the office and migrate it elsewhere. In the spring of 2000, IAL released a vision video for the "connected home." Following the lives of a family spread across three cities, 3 time zones, 2 countries, 3 households and 4 generations, it is an evocative statement about how it might feel to live in a smart home.

The connected home is a good place to live. An invisible pulse flows through every room ... the pulse is the Internet ... The connected home empowers the people who live in it ... The connect home facilitates and enhances the thousand daily interactions that make a family close, make friendships work and businesses prosper and communities thrive. From PC-connected devices within the home, to outside links the web of connections is seamless and natural ... Connection is many things. It is a basic human need, and at the same time, our highest calling, follow this calling and you'll find yourself home. (IAL 2000 a)

This notion of connection grew out of the work of Peoples and Practices Research (PaPR), a small team of social scientists and designers working within IAL. Members of PaPR have been conducting ethnographically inspired research in the home sphere since the mid-1990s and their work has helped shaped the research and development agenda within IAL (IAL 2000 b &c, Matheas *et al.* 1996, Salvador *et al.* 1999). In the last two years, Bell and colleagues have conducted extensive fieldwork in the US, Europe and recently China. This fieldwork has been focused on the ways in which people occupy, use and talk about their domestic spaces (Anderson *et al.* 1998, IAL 2000e). While PaPR does not have its own domestic space for design, it has found ways to bring some of those sensibilities to the R&D practice at Intel. This influence is expected to be enhanced by



the recent hirings of two up-and-coming interaction designers and a pre-eminent British industrial designer.

### **Smart Houses & Smart Homes: Academic Research**

With support from industry partners, a number of academic research institutions also have domestic design spaces, such as the *Aware Home* at Georgia Tech. The Aware Home Research Initiative is “a focused research program, whose goal is to develop the requisite technologies to create a home environment that can both perceive and assists its occupants” (AHRI 2000). Researchers at Georgia Tech felt that in order to design technology for the home, they needed to have a home in which to design, “Because we feel that any significant research in this area must be conducted in an authentic yet experimental setting, we are building a home that will serve as a living laboratory for ubiquitous computing in support of home life” (Kidd *et al* 1999). The home, some 5,040 square feet, will consist of two independent, two-bedroom living areas. One living area will serve experimental purposes, and the other will be occupied by actual residents (Sanders 2000). It is slated for occupation in the spring of 2001, and suggests a radical reinvention of the smart house format, and, above all, reclaiming the smart house as a smart home.

A very different example can be found in the Rhode Island School of Design's *Universal Kitchen* (Costa 1999, RISD 1999, Turrettini 1998). In 1993, an interdisciplinary team of students and faculty from Industrial Design and Interior Architecture, in partnership with a range of foundations and corporations, initiated a project to “recreate the kitchen, an

everyday icon of poor design” (RISD 1999). Like many other industry/academic collaborations in this area, there are no obvious key players; rather, there is a diversity of investors and interests. The *Universal Kitchen’s* sponsor list reflects this range.<sup>10</sup> Arguing that the American kitchen had not changed in basic design and configuration since the 1930s, the *Universal Kitchen* project offered a new interpretation on this domestic space. Some four hundred subjects were studied making a succession of simple pasta dinners in a range of typical kitchens. What emerged from this research was a sense that kitchens lacked a “Comfort Zone” – “the vertical space in the kitchen where items can be reached without having to squat, stretch or strain” (Turrettini 1998).<sup>11</sup> Working around this observation and its implication for an expanded range of kitchen users, two full kitchen prototypes were built: one for a large family living together (“Max”) and one for an individual or couple in an apartment (“Min”). Both Max and Min kitchens were built for modular component parts that could be custom selected and arranged to suit “... people of all ages and physical abilities” (RISD 1999). The Universal Kitchen went on display at the Smithsonian’s Copper-Hewitt National Design Museum in 1998. In September of the following year, the Maytag Corporation announced it had signed a technology transfer agreement with RISD. Under the terms of the agreement, Maytag obtained exclusive worldwide rights to the Universal Kitchen (Maytag 1999).

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<sup>10</sup> Support for the *Universal Kitchen* project came from Malcolm and Elizabeth Chance; KGK Foundation Trust; Worrell Fund; Dow Plastics; Broan-A Division of Nortek; International Paper-Decorative Products Division; Masco Corporation; Schott Corporation, Technical Glass Division; Monarch Industries, Inc; Notch Design Group; Jutras Woodworking; Item Products, Inc; SUSPA Inc., Häfele America Co., Illumination Concepts; Lightollier; Fulcrum Product Development; Norman Methot Woodworking; Thomas O’Brien Woodworking; and Drama Lighting Inc (RISD 1999).

<sup>11</sup> Comparisons to Lillian Gilbreth’s “continuous kitchen” of 1920s are generative (Gilbreth 1928, Lupton and Abbott-Miller 1993). It is Gilbreth’s kitchen design that the RISD is tackling. Yet, Gilbreth’s kitchen design was also based on extensive studies of use and sought to solve a very similar problem. And while it is possible to argue that Gilbreth designed her kitchen with able bodied female home-makers in mind, she did do several projects with amputees and took a range of disabilities into account in her domestic redesigns.

At the Media Lab, the Counter Intelligence group has created its own design and display space (Counter Intelligence 2000), offering a blend of ideas about technology and design. The smart kitchen space, known as *La Cantina*, is now two years old. Housed in the basement of the Media Lab on its campus in Cambridge, Massachusetts, it is an unexpectedly intimate domain. Unlike many other smart homes spaces this one has a sense of occupation and use. The glass wall opening onto the corridor is lined with potted herbs, in varying states of green and decay. A counter top is busy with spice jars, canisters, open containers and a pile of recipe books, while the sink – almost invariably - has dirty dishes. Even the smell of coffee sometimes fills the small room as researchers gather to talk. Sponsors almost invariable love the kitchen, because it so recalls the look and feel of a “real” kitchen.

Yet this “real” kitchen also contains innovative ways of blending social practices and technology. Wendy Ju’s *counterActive* elegantly implements an interactive recipe in the kitchen, inventing a grammar of physical space as part of the interaction (Ju *et al.* 2000, Ju *et al.* 2001). The recipe is projected down onto the counter and the cook touches the countertop to move through the recipe or glean greater details. The counter conceals a capacitive touch sensor, hidden beneath the one-inch thick counter. *counterActive* blends in with the environment and architectural space of the kitchen. It is the first computerized recipe system we have seen that not only expands on the conventional cookbook by incorporating pictures, audio and video, but deals better with being covered in spilt milk. It is about enhancing the experience of cooking, not about making more

efficient meal production. Recipes contain side links and facts; a cherry tart recipe will tell you the number of cherries on an average tree, and a recipe for chicken Provençale includes the sights and sounds of a typical French market.

Kaye designed the kitchen before it was clear what all the details of the research plan for Counter Intelligence would be. Yet its design recalls many apartment kitchens – it is laid out along three sides of a square with appliances, counter space, and shelving, only the glass wall to the corridor betrays its unique location. The twelve by twelve foot square is cramped (as a research space) and we have found that the current implementation doesn't give us enough space for sitting around a table and talking – a problem not unfamiliar to many urban dwellers. As the use of the space has evolved over time, we have found the affordances of the physical space have greatly influenced our research. Taking into account a two-year occupation of *La Cantina*, the on-paper redesign removes a wall of counter space and places a round wooden table in the center as a work and conversation space, facing in. We now wish to emphasize the human priorities of communication and interaction, inspired both by our experiences in using the kitchen and by Bell's team's work on the primacy of communication and affect taking place in the kitchen.

## **II. “Don't they have kitchens in America?” Getting beyond the smart kitchen**

The recent publication of two edited collections, focused principally on Europe and the UK (Birdwell-Pheasant & Lawrence-Zùñiga 1999, Cieraad 1999), offer some extremely useful ways of interrogating the domestic sphere – locating it within broader historical contexts, consumption patterns, and government regulations (Attfield 1999, Munro &

Madigan 1999, Putnam 1999, Shove 1999). What is clear from our own ethnographic work in the US and Western Europe is that the kitchen is an important space within the home. What is equally clear is that its function, and the experiences and activities it supports varies from culture to culture, context to context, even season to season. We have encounter kitchens that were showpieces (mostly in the US); we have seen kitchens that were the social hub of the home (Italy); we have seen little tiny kitchens (mostly in the UK) and a full range of appliances from fridges to automatic polenta stirrers and water dispenses. What remained a constant, however, was that people talked about these kitchens as places in which they lived.

In May of 1999, Bell and one of her colleagues conducted a pilot field study in a small community in northern Italy. They were interested in understanding the ways that people occupy and use their own domestic spaces, the ways in which those domestic spaces are embedded in the larger community and the role that technology plays in facilitating (or hindering) those occupations, uses, and relationships.<sup>12</sup> We arrived in the first weeks after the Columbine school shooting in the United States, and American culture was under much scrutiny in the Italian media. Sitting around Fulvia's dining room table, I was asked what the family room was. My answer included the facts that this was a space in some American homes where families gathered to talk, watch television, do homework, play games, read, eat and spend time together. Fulvia looked at me and asked "Don't they have kitchen in America?" In thinking about kitchens this way, it is easy to imagine them as a sort of ecology. And while anthropology does offer provide some helpful ways of

articulating this notion of ecology (Rapport 1968, Durham 1991, Bell 1999, Nardi & O’Lay 2000), very little is based on work within the western home.<sup>13</sup>

### **La tavola é la Vita : The Table Is Life**

Fulvia’s house is on a main access road into her little Italian town. There is no sidewalk to speak of, and the high metal fence and gates front onto the street. Standing at her gate, ringing the buzzer, requires paying careful attention to the traffic, while listening for Fulvia’s voice, tinny through the house security intercom. On the first day, I was received through the front door; later when I was expected to come through the side-door directly into the kitchen, Fulvia told me that the front door is really just for “priests and tax men.” This layout of the house, with the kitchen away from the street, at the back of the house, with its own side entrance is common in Italy. The kitchen is the central social hub of Fulvia’s home. It is about a long room, full of things and people. About 10x15, it has three doorways; a side entrance into the driveway for family and friends; the step-up doorway to the rest of the house; and the back-door onto the covered patio space where the laundry hangs to dry amidst a seeming chaos of boxes, chicken coops, flower pots and old bicycles. Appliances and storage line the walls; the family’s calendar and recycling schedule is attached to the side of the freezer. The table always has a cloth. You can judge the meal by the tablecloth – slick plastic at breakfast, fabric for the main meal in the early afternoon. On the room’s second table, against the wall, is the household’s main television and set-top box. In front of the television, there are always bottles of oil,

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<sup>12</sup> Oldenburg’s work on ‘third places,’ or those “distinctive informal gathering places ... [that] represent fundamental institutions of mediation between the individual and the larger society” (Oldenburg 1999: xxviii) provides one useful way of articulating these relationships between home and the rest of the world.

stages of food preparation and the bits and pieces of any kitchen – a cordless telephone, pieces of paper, the detritus of a 5 person household. Everything happens there – cooking, eating, talking, homework, watching television, socializing, paying bills, organizing children and calendars and travel, looking at photos, sitting quietly.

[Table as central / food as identity /story & narrative]

### **Alle zussamen: All Together**

Stuff here re: german kitchens. Don't Mention The War.

Deliberate points of family togetherness

More closely linked to eating spaces (not kitchen – seasonal)

### **Ci vous et saouif, allez au café : If you're thirsty, go to a cafe**

About how articulate relation sto rest of owrkld

home in marketplace

food as sensuousness

food as ethnic identity

### **III. Our Manifesto: think domestic, not digital.**

be guided by convenience, not convention

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<sup>13</sup> Here we are mindful of Sawhney's injunctions regarding the power of metaphors to shape and ultimately limit of thinking (Sawhney 1996), but find the organic-ness of ecology productive.

consider the personalities and habits of our family, yourself included" –  
Lillian Gilbreth (1956: 158)

Food, cooking and kitchens represent a significant set of icons in Western, as well as non-Western cultures. They are evoked, deployed and employed as metaphors and shorthand – as stand-ins for longer conversations and more complicated plays of meaning and history.<sup>14</sup> Recipes are family secrets, national identities, corporate mysteries, poetry. Foods are memories of lovers, vacations, childhoods, family dinners gone wrong, family dinners gone right, first dates, last dates, and shared memories. Cooking is a chore, an act of love, a ritual, a lesson. Yet, in the American corporate context, food has been seen as a fuel, cooking a task and the kitchen a site ripe for Taylor-like interventions. Indeed over the last century, American kitchens, cooking, and food have been the ongoing sites for strategic interventions aimed at reducing cooking to a domestic science, the kitchen to a collection of labor saving devices, and food to pre-packaged extremes. Of course, this corporate conception of the kitchen is by no means hegemonic and within both the US and Western Europe, it is possible to find alternate models for understanding the “kitchen.” These counter-narratives provide one way of reclaiming the kitchen as a significant ecology with its own interplay of objects, actors and experiences. By mapping ethnographic research from the US and Europe onto some of the design innovation arising from the Counter Intelligence group, we can imagine anew the relationship between food, cooking and kitchens that does not privilege technology.

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<sup>14</sup> Within anthropology, there is a long history of thinking about, documenting practices around and theorizing food (Levi Strauss, Douglas, Harris). More recent works have considered the ways in which food is mobilized as a way of talking about and constructing particular national or ethnic identities (Harbottle 1996), as well as creating or negotiating global ones (Mathews 2000). Feminist scholars have



As technologists designing for the kitchen, we are most frequently thwarted by the ways in which technologies of food are portrayed in popular media: how can we ever compete with the replicator on *Star Trek's* Enterprise (“tea, Earl Grey, hot”), the *Jetson's* Rosie the Robot or the Chocolate River in Roald Dahl’s classic *Charlie and the Chocolate Factory*. The expectations of perfect performance, boundless resources (that require no storage), the right food, and no labor are impossible to meet. Fortunately, what underwrites these expectations, that technology should support experiences, is perhaps easy to match. Clearly one solution is to better understand what people are already doing in their domestic spaces and design around those activities. Another approach is to document the things that people cannot do in their domestic spaces, but activities for which there is a historic preference or an expressed desire. At least one Counter Intelligence project – *Robocrop* – plays on this latter approach (Kaye & Thordason 2000). *Robocrop* augments a hydroponic kitchen garden with sensors and actuators to help the cook to feed and nourish the plant and keep the owner updated on the current state. Despite some dramatic failures, our kitchen garden currently produces tomatoes, peppers, and complement of cooking herbs – rosemary, basil, mint, Greek oregano, and the like. This technology could enable today’s cook to compactly and efficiently grow and care for a kitchen garden within the walls of a cramped apartment – “Tomato, Roma, Ripe.” Unfortunately, *Robocrop* remains at the mercy of hydroponic technology – which is by no means flawless. Yet, even in its less than perfect state, it offers a glimpse into a kitchen that might support a wider range of domestic activities, not overtly digital ones.

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written about the ways in which food figures into narratives of gender and the body (Varney 1996, Counihan 1999) and is articulated as a site of resistance and power (all the stuff on anexoria).

In getting beyond thinking of the kitchen as a space that needs to be instrumented, one is immediately struck by the range of experiences and activities that transpire within that space. There is a growing recognition within the technology industry about the importance of emotion and affect (Hofmeester *et al.* 1996; Nardi and O'Day 2000). Philips recognizes the importance of emotion. In their *la casa prossima futura* they offer us “emotion containers” – lustrous nesting dolls shaped objects.

Emotion containers are small personalized multi-media products which contain a screen, a speaker and a scent compartment. They are designed to be given as special presents and are attractive on two levels: as cherishable objects in their own right, and as carriers of messages of significance. (Philips 1999a 26-27)

Recognizing the importance of intimacy and communication has also inspired applications of smell as a Media Lab project (Kaye 2001). *Honey, I'm home* sits on an office desk and emits a burst of scent when a loved one comes home. For example, Kaye has explored – on paper, to date – what an intimate dinner for two would involve the participants at Internet distance apart. This arose from a brief discussion with a major American food manufacturer. Their initial conception involved a typical video conferencing setup, with a hemispherical table with a large screen at the end. Exploring the concept of intimacy, the senses need only a chance to connect – a small video screen, for glancing, no staring, a camera in a vase. A pair of candles, each one lights when the other is lit. The sound of wine being opened and a chair scraping back at the end of a meal are important in a different way to speech and laughter.

Yet, traditional industrial/commercial views of the kitchen see it as a simple, beginning to-end process: buy ? cook ? eat ? clean. This is, indeed, logical when all one is

concerned about is selling tools for a single step of that process. Dishwasher manufacturers do not communicate with the manufacturers of the food that their machines wash off; in fact, they barely communicate with the manufacturers of the dishwashing detergent their machines use. The place where this communication happens, when one realizes that the chain flows both ways and wraps around, is the home.

The short- and medium-term reverberance of poor, non-user-centered-design on the manufacturer is limited. In the United States, the replacement cycle for a fridge is thirteen years (Consumer Reports). Yet corporate America amortizes technology over a three year cycle, and most other capital expenditures over five. Rarely do companies have more than a five year business plan. In this environment, an economic calculation of a thirteen year cause and effect is beyond the powers of corporate accountancy. It is the consumer who must put up with a contrived implementation of short-term money-saving values; we argue that it cannot fail to be the manufacturer who suffers, too, in the end.

How do you design for intuition: that alchemy of flour, butter and sugar transformed into dough; the tension in a spoon stirring polenta perfectly made; the balance of spices remembered in the tip or a wrist? We argue for respect for the multiplicity of users and their skills, for carefully crafted observation, and for a respect for one's own product. We argue that there are invariably long term gains that can happen for both producer and consumer in simple awareness of the domain of the experience. The experience is the fundamental unit of interaction; no interaction happens in a void.

We propose a kitchen/technology relationship that draws on and learns from the rich cultural history of the kitchen, and, above all, focuses on the humans who experience the space, rather than the technologies that reside therein. We have promised a plan for the future of technology design for the home and kitchen – or, as we describe it, a kitchen manifesto. How, then, to summarize our arguments into a generative set of rules and guidelines for a new era, driven not by design or technology but from a concerted effort to learn from the mistakes of the last hundred years? We propose the following:

1. Experience over efficiency
2. Understand the use of objects in a wide context.
3. Context is key.
4. Context is cultural.
5. Context is dynamic.
6. Focus on the individuals
7. Consumption happens in cycles

In this article, we have argued that it is necessary to disentangle the kitchen, and by extension other domestic spaces, from the relentless rhetoric and logic of the smart home. In this article, we have suggested a new approach to thinking about and designing for the kitchen specifically, and domestic spaces more generally. Our primary focus in this paper has the West: the questions surrounding the kitchen as it applies to the United States, Canada, Australia, New Zealand and Western Europe. We recognize that designing outside of the West has a whole other set of challenges and issues, but feel that much of our material and conclusions will have salience in these other contexts. This new approach draws inspiration from a range of disciplines and intellectual practices, including anthropology, sociology, feminist theory, computer science, ethnography and human-computer interaction design, and grows out of some of the research and projects

conducted within our respective home institutions. As a female social scientist in a company of male engineers, and as a humanist in an organization of technologists, we have a unique vantage point. Our work is implicated in and mobilized for the design and development of new technologies, yet we remain outsiders talking back to our respective institutions in voices and about subjects they are sometimes unable to hear. It is our hope that this new approach privileges real people and lived social practices, and in so doing challenges many of the ways in which industry has constructed and created the domestic.

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