

A house called HAL

Someday soon, MIT researchers say, you'll have a home that thinks it's smarter than you. Is this progress?

BY DAREN FONDA

You live on a pretty street somewhere in America. You are married, with kids, and you work a lot, mainly from your home office. Life is so hectic that you have no time for yourself, and you're looking forward to a getaway in Paris with your spouse. Before you leave, though, you'd like to improve your French and learn more about the culture. Meanwhile, you're thinking more prosaically: What do I make for dinner? You decide to tap into that uncanny reservoir of intelligence, your house.

First, you turn to your kitchen counter — which has a small LCD screen with Internet access — to search the Web for software on France. Your digital helper quickly suggests a program called “Learning French Culture in the Home.” You tell it to pay for the software, and it's instantly downloaded. You smile as the electronic picture frame embedded in your wall glows with images of a lush Bordeaux vineyard.

Then it's time to cook. You ask the house what you can make with the food

you've got. “Thinking” that you would like something to match the moment, it suggests five French recipes. There's a fancy chicken dish you've wanted to try, yet you're missing a couple of ingredients. No problem. You instruct the house to buy the items, which are delivered through a shuttling system linked to a grocery distribution hub nearby.

Meantime, your home realizes this is an opportunity for you to learn French. Your kitchen takes on a stronger French ambience: Edith Piaf sings in the background; images of Notre Dame and the Champs Elysees fade in on the video screen. As you cut your vegetables, your home gives you a little French lesson, saying “*Vous coupez les legumes*” (“You are chopping the vegetables”). You repeat the line, and, as you continue preparing the meal, you learn other phrases.

Sometimes your house amazes you, it's so smart. It knows you're alone in the kitchen, and it notices when your daughter comes in. Earlier, the home had been running a program for her on the science of food, and it's now consulting the Internet for information on the foods you're using for your meal. Since you're cooking with wine, an interactive display on grape distillation pops up. The home stops talking to you in French, realizing it's inappropriate with your daughter in the room. A short film on Louis Pasteur starts playing on the wall, entralling her as she nibbles some carrots. After it's over, she runs out to have a

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2 Adaptable space

Movable walls, cabinets, and work surfaces can accommodate changing needs. For instance, a space used for work during the day may become a place for formal dining in the evening. The home opens to the exterior in spring and seals itself in winter. Transparent window glazing can change to translucent for privacy or to opaque for light control.

3 Aid and comfort

Homes will be planned according to universal design principles that accommodate both the very young and the elderly. Appliances, storage units, etc., can be upgraded or adapted according to need. Counter heights will adjust to the user. Low-cost robotic appliances will help with tasks such as putting away groceries or vacuuming.

4 Versatile walls

Exterior walls create and store energy with technologies such as thin-film translucent photovoltaics, clear insulation, and solar mass for heat storage. Modular wall elements can incorporate moving and storage systems that will automatically distribute goods throughout the home.

5 Clear connections

Multisensory, interactive technologies will allow people who are apart to feel they are face to face. Here, a girl on a visit to Monticello dances with her stay-at-home dad.

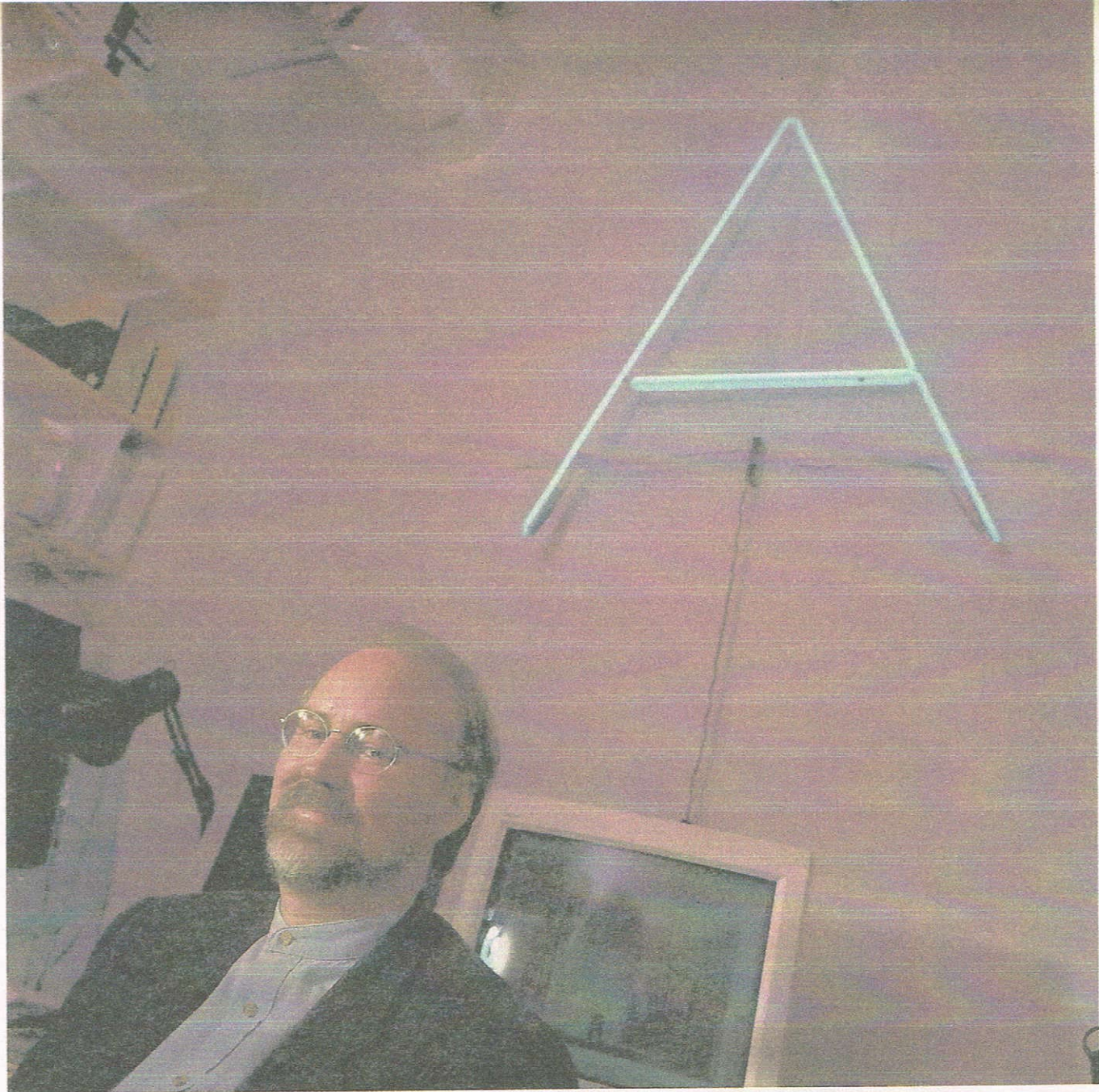
6 Daily checkups

Small, unobtrusive, wearable wireless sensors will allow the home to continuously monitor occupants' health, exercise habits, and nutrition, helping to identify potential problems. You will "visit" your doctor for a checkup without leaving the home.

7 Ubiquitous computation

The low cost of computers means nearly all surfaces can contain sensors so the home will recognize what people are doing and anticipate what they need. In time, a home will "learn" the lifestyle of the occupant.

MIT research team: Kent Larson, Chris Leubkeman, Stephen Intille, Charles Kukla, Ron MacNeil, Kenneth P. Wacks, Greg Demchak, Christopher Mulvey, Kevin Settlemire, Byron Stigge, Michael Wilcox, Luke Yeung, Zeke Floro, Lee Knight, Katie Calef, Karl Daubmann, and Nico Kienzl



Kent Larson and his team at MIT are designing the house of the future: a house that adapts to you, changes with you, does, in effect, whatever you ask.

teleconference with her classmates, and you hear her tell them all about pasteurization. Just then, your home gently reminds you – in French and, then, because you didn't respond, in English – that your *coq au vin* is ready.

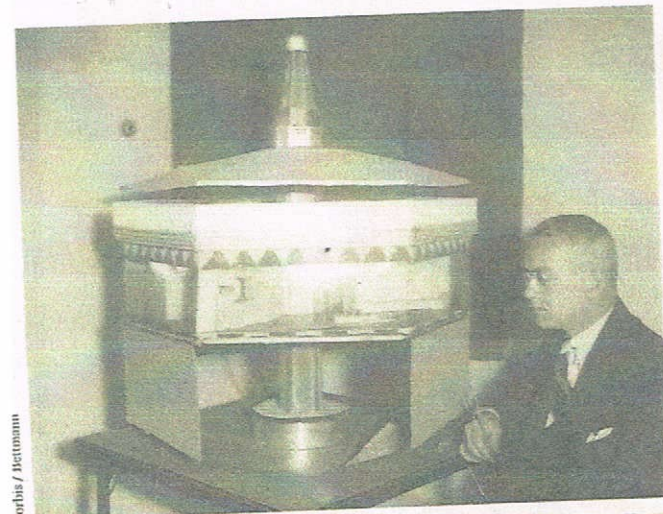
SOUND OUTLANDISH? A BIT TOO MUCH LIKE SCIENCE FICTION? Not to architect Kent Larson. If he has his way, this vision may soon seem more like *Ozzie and Harriet* than *The Jetsons*. The scenario is something Larson and his team dreamed up recently to win support for their House of the Future project at MIT. On his drawing board are plans to build three of the world's smartest dwellings: a laboratory house on MIT-owned land in Cambridge, near Central Square; a "transgenerational" home, designed to address the needs of retiring baby boomers, tentatively planned for Hilton Head, South Carolina; and a house showcasing the next generation of energy-saving materials (for which a site has yet to be determined). So far, there are no blueprints for any of these homes; the lab house is the only one scheduled for construction,

starting in about a year. Nonetheless, as it gets underway, the \$11 million project promises to be one of the more comprehensive attempts at forecasting domestic life a few years from now.

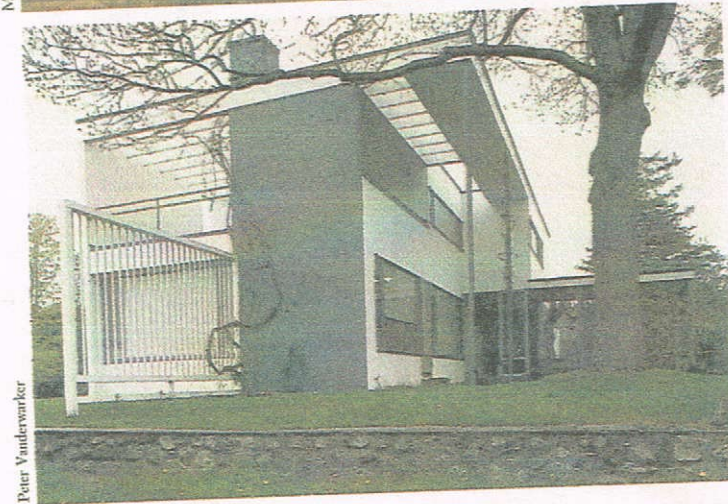
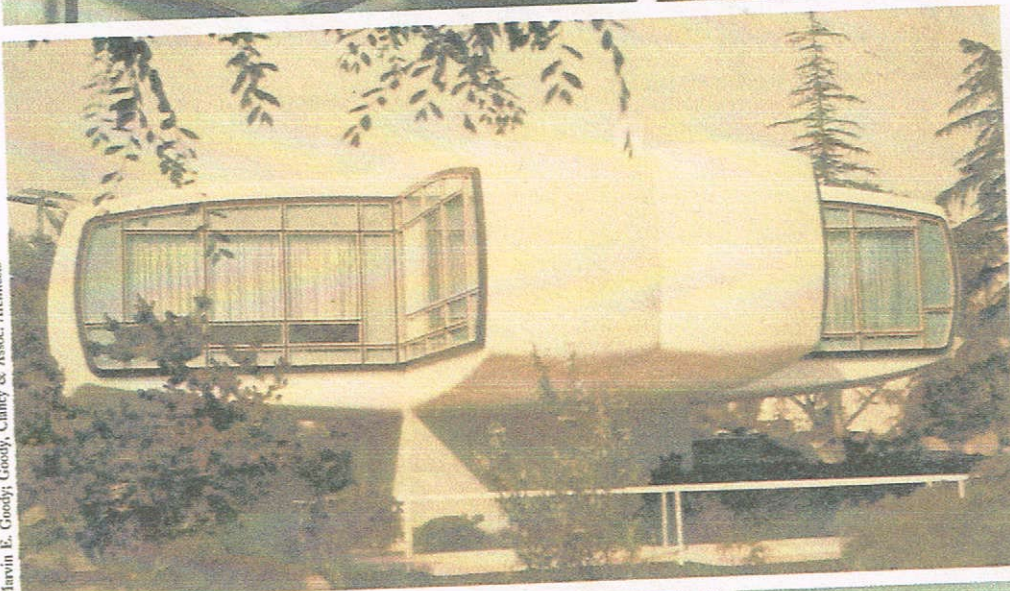
As its chief visionary, Larson is guiding several teams of future-minded folk. Computer scientists are writing software that will enable the laboratory house to learn and adapt to its occupants' routines; engineers are making prototypes of smart appliances and of walls that will "think" for themselves – and for you – as well as assorted other digital gadgetry. Architects, graduate students, and artists are grappling with design issues, conceiving ways for the house to fit its residents' lifestyle as closely as a handmade glove. Larson will ensure that all these experts communicate, devising solutions from a whole-house perspective. Forming a consortium, they will develop their own technology, supplementing it with help from MIT's engineering departments and laboratories.

Outside institutions are getting involved, too. Researchers from the division for aging at Harvard

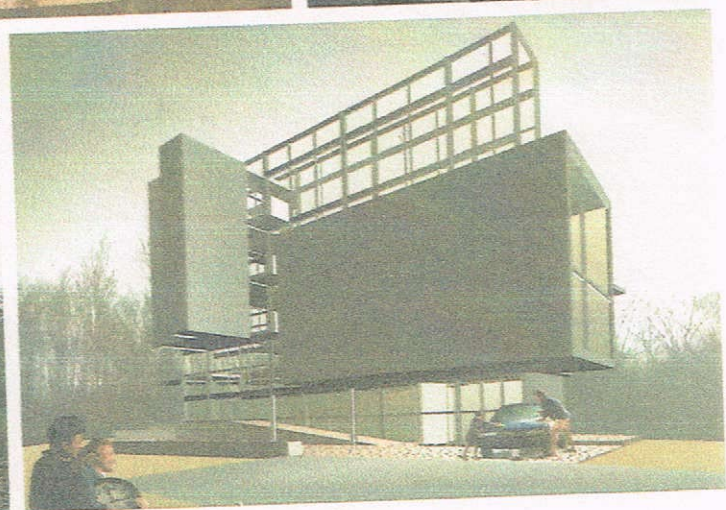
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Peter Vandewalker



Peter Vandewalker



Hariri & Hariri

Clockwise from top left: Buckminster Fuller with his Dymaxion Dwelling Machine. Unveiled in 1945, it boasted walls that were supposed to generate their own energy, thin but effective insulation, and inflatable furniture — along with ultraviolet lighting for indoor tanning. ● The Digital House, by New York architects Hariri & Hariri, would be built from prefabricated modular panels that would plug into the steel structure like an industrial shelving unit, allowing the house to be reconfigured at will. ● The Walter Gropius house in

Lincoln displays the hallmarks of the Bauhaus movement that Gropius founded: a complete conception of the environment — from the planning of space to the design of the utensils — and an emphasis on functionalism. ● Architect Marvin Goody designed an all-plastic, quad-winged house for Monsanto that went on display at Disneyland in 1957. Nearly everything was made of the synthetic material, from the kitchen counters to the desks, chairs, and folding room dividers.

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