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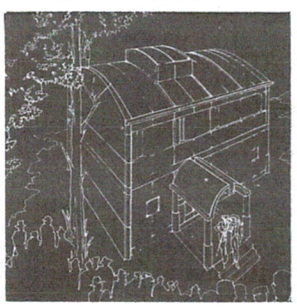
For '85: new directions in high-tech housing

AN OVERVIEW

By EVERETT H. ORTNER



Is it possible that while rising costs have ruled out a custom-designed house for most people, computers may bring it back? That seems to be the message from many sources: from companies like Wickes Lumber (see below), whose computers customize general house plans to individual needs; from architect Donald Greenberg of Cornell University, who predicts that, with computer-aided design and drafting (CADD), there will be architectural "common data bases" and "drawing will be mostly automatic"; from R. Bruce Patty, president of the American Institute of Architects, who sees computers as the most significant change in architectural practice "since the invention of the T-square." Certainly, it's the message from Japan, where giant factories—the largest of their kind in the world—produce housing components that are designed, produced, and assembled by computerized systems.

But the world of high technology that this 15-page section of POPULAR SCIENCE explores touches many other changing areas, too: of materials, design, and technology. How about a high-tech wood house (drawing above) with a skin of bolt-on plywood panels? It's the award-winning design of Chicago architect Michael S. Siegel. Wood is unquestionably a material of the future—it's versatile and it's renewable. But then it also seems clear that all current materials will figure heavily in the future: concrete and steel, obviously, and plastics in many forms, even as a structural material ["Foam Home," PS, Jan. '84]. Plain earth, too, seems to have a future as a building material. PS articles on rammed-earth technology, the process of molding building bricks out of earth [PS, Dec. '81, Nov. '82], have received extraordinary attention.

What about earth as a sheltering material? Some of the attraction of earth-sheltered home design seems to be waning. Costs and energy savings have been disappointing; materials failures have been common. But there have been many success stories, too. One of them, the Lovins house, which author Marty Carlock writes about in this section, is also an exemplar of all the ingenious energy-saving technologies that have been devised in the last decade: superinsulated walls and windows resulting in a zero heating bill, solar collectors for domestic hot water, water-conserving toilets, and so on. But the Lovins house cost $500,000 or so. That's also the ticket for Boston Edison's experimental Impact 2000 house, which uses $60,000 worth of photovoltaic cells to generate 4.3 kilowatts of electricity. For most of us, that's not the way to go—for now, anyway.

What is the way to go? Much of today's high-tech building technology suggests what tomorrow's standard technology will be like: a technology built on computerized factory manufacture. Indeed, the threat from foreign manufacturers, eyeing the huge American housing market, might have much the same impact on our present archaic, labor-intensive building technology that the Japanese auto industry has had on Detroit.

Factory technology is not new to America, but it is a small component of our housing industry. And much of that technology has been devoted to turning out houses of the poorest quality —the jerry-built mobile homes that litter our landscapes. But the prospects seem to be improving rapidly, as PS Group Editor Al Lees points out in his column, "Shop Talk," farther back in this issue. Several factory-built modular homes were displayed at the annual National Assn. of Home Builders show in Houston, and Lees concludes with: "The modular concept has never been launched in so many exciting directions at once—all healthy signs for our developing housing technology."

CADD HOUSE

By V. ELAINE SMAY

"I'm interested in a passive-solar house of contemporary design," I said to Tolland, Conn., architect Dennis Davey. He sat down at his Apple Lisa computer and started pushing its palm-size "mouse" around the desk top. As he shoved it to the left and zipped it back to the right, a tiny rectangle on the left side of the screen moved to the center, growing large as it traveled. "Let's start with the floor plan," he said.

Davey, who designs houses and small commercial buildings in the Hartford, Conn., area, is one of a handful of architects in small firms who have traded T-square and drafting board for a computer. Even without commissioning such an architect, though, you can take advantage of computer design for your next house. The giant chain, Wickes Lumber, sells a series of house plans that can be computer-customized to meet your needs.

Davey bought his first computer, an Apple II, in 1979. "Around 1982 I started seriously looking at computers that do architectural drafting," he told me. "They were $80,000—and above." These powerful computer-aided-design-and-drafting (CADD) systems are trickling into the offices of large architectural firms, but their cost makes them prohibitive for most small firms.

In 1983 Davey saw the Apple Lisa [PS, June '83]. It had a 32-bit processor, which meant it could do complicated tasks, such as graphics, fast. And it had a mouse: Move the mouse, and the arrow on the screen moves in tandem. For design and drafting, the mouse is your pencil: You can draw freehand with it or choose from an array of shapes and patterns stored in the program. Davey sprang for the $12,000 cost of the computer, printer, and software (for design and drafting he uses a program called LISADRAW). "I was about to hire drafting help, so I knew it would pay back quickly," he said.

At the screen Davey demonstrated the speed and accuracy of computer design, and the razzmatazz, as he calls it. With one move of the mouse he zipped the arrow to the top of the screen and chose a pattern from one of LISADRAW's menus, doing it so fast I couldn't read the menu. "The mouse has become an exten-

Continued

sion of my hand," he said. In an instant a pattern shaded in the wall thickness on my floor plan.

As Davey listened to my requests, the various rooms grew and shrank within the plan. He'd work for a while on one section at full size (¼ inch equals one foot), then shrink the image so that we could see the whole plan at once. "Let's put a coat closet in the foyer," he said after he had centered an entry door —automatically—on the facade. A closet-shaped rectangle dropped into place on the screen. "Oops, the front door opens up against the closet. I'll just reverse the door." And the door symbol did a somersault, landing with its opening facing the other direction. "With a computer," he said, chuckling at my delight, "if you make a mistake, it's easy to fix."

When we were both satisfied with the floor plan, Davey duplicated it, then flipped the copy to see if I preferred it reversed. "You only draw an object once with computer drafting," he pointed out. He gave me more options as he worked on the elevation. First, he put horizontal siding on the house, then duplicated the house and showed it with vertical siding. He duplicated it again and enlarged the kitchen windows. Finally, he made a third copy and drew in clerestory windows. In mere minutes I had a choice of four facades.

The whole process took about an hour. When I OK'd the plan, Davey made a printout. "One drawback of my system," he admitted, "is that my printer takes only 8½-by-11-inch paper." For my design, the printer spewed out 15 sheets of paper, which Davey pasted together into a two-by-three-foot whole. Had I been an actual client, I would have studied the plan for a week or two. Then we would have met again in front of Lisa's CRT.

Computer-modified house. When you buy a house plan from Wickes Lumber's Computer-Assisted Planning service, you choose from a catalog of 28 and pay $200 for a set of basic plans. You note the changes you'd like right on those plans: Windows and doors can be relocated, window sizes and styles can be changed, and the house can be enlarged, for example. Your marked-up plans go to Wickes's computer center in Atlanta. In two to three weeks your computer-revised plan, elevations, materials and cutting list, and printouts detailing the construction of each wall panel arrive back at the store. Once you approve the plans, Wickes quotes a price, good for 60 days, on the materials. "For $35,000 to $65,000 a do-it-yourselfer can get into a customized house that otherwise might cost $50,000 to $125,000," said Rick Clapp, Wickes's director of packaged homes.

(Wickes also has a kitchen-planning service, available in seven test markets: Endicott, N.Y.; Exton, Pa.; Wilmington, N.C.; Bakersfield, Calif.; College Park, Ga.; New Braunfels, Texas; and Baton Rouge, La. Sears has a similar service in all stores. At Wickes, the salesperson enters data about your kitchen into a computer in the store, and you see a floor plan and elevations on the screen. At Sears, the computer design is done outside. Both stores provide printouts of the plan, elevations, and a list of cabinets needed—and their prices.)

TALKING HOUSE/SMART HOUSE

By WILLIAM J. HAWKINS

"Living-room light," he says as he gets up from the chair.

"What do you want me to do with it?" asks the house.

"Dim it," he replies. The light narrows to a soft glow.

"The light is now dimmed," reports the house. "Anything else?"

"No."

Step into Andrew Alloco's Miami home. When you do, you too can become the master of an electronic servant that not only dims lights but controls the air conditioning, heating, water heater, telephone, pool water, Jacuzzi, and burglar alarm, too. Speak, and Alloco's Apple II computer listens. Command, and it obeys, remotely controlling a variety of devices throughout the house. And at the appropriate time, it conveys its information to you orally through a speaker system.

Alloco's talking house is one of perhaps hundreds scattered across the country. Off-the-shelf products are now available to convert a variety of home-computer brands into house controllers. And there are stand-alone systems. For example, General Electric's HomeMinder [this issue] is a computer designed specifically for the remote control of home appliances. It now seems likely that computers will take control of future homes, and, from what I've learned, that's only the beginning. We may someday live in something called a "smart house."

"We can eliminate the possibility of electric shock and electrical fires," says David MacFadyen, Smart House project director for the National Assn. of Home Builders (NAHB). "Homes of the future won't be passive. They'll be intelligent—smart houses—and they'll be equipped with smart appliances."

MacFadyen's plan: Eliminate all high-voltage AC wiring, and replace it with low-voltage DC. Then eliminate all present home appliances. Replace them with low-voltage models that use a microprocessor to communicate with the house circuitry.

"Plug in a smart iron," says MacFadyen, "and it tells the house how much power it needs. Plug in a smart radio, and it does the same thing. Each appliance receives just enough power to make it work." That conserves energy, and it makes the system shock- and fire-proof. "Nothing happens if a child touches the outlet or if there's a short in the system," he says. "Without an appliance plugged into the outlet, the house won't be told to turn on the power."

Appliances will also communicate with the home's central computer. When the clothes in the dryer are finished, you won't hear a bell in the basement. Instead the computer will tell you via video monitors installed throughout the house. "The monitors can be used for entertainment, too," adds MacFadyen. "When you want to watch a videotape in the bedroom, the computer will turn on the VCR in the den and send you the movie."

All this will require an enormous cooperative effort among electronics and appliance manufacturers, and plans have already begun. I attended the first Smart House conference held late last year in Washington, D.C., where NAHB first posed the concept. Representatives from 100 companies and government agencies crammed a meeting room to listen. At present, 25 have signed with NAHB to develop products or services for the first test house, scheduled to be completed next year in Maryland.

Meanwhile, many other companies have already begun work to produce electronic products for future homes. For instance, Integrated Communication Systems, BellSouth Corp., and The Southern Co. have created TranstexT, a system that combines the control of home appliances and in-home information services with the telephone and TV (see left center photo, facing page). Your TV graphically displays a telephone's push buttons and a list of items such as home security, banking, and electronic shopping. To make a selection, you use your telephone to dial the number shown on the screen. But not all products need to be as sophisticated as TranstexT to be clever. For example, Brand-Rex Co. is about to introduce a three-in-one outlet box and cable system (bottom photo). In one pass, cabling and connectors for telephone, TV antenna, and AC power are added throughout a home.

Undoubtedly, the highly organized research and development efforts of major manufacturers will make the high-tech intelligent house a reality. But don't discount such computer buffs as Andrew Alloco, who always seem to be one step ahead of everyone else. Alloco is currently perfecting a pocket device to allow remote communication with his house at all times. What lies in *his* future? Like other futurists, his ideas could come from just about anywhere:

"Are you busy?" he asked as I was leaving.

"I'm thinking," said the house.

"About what?"

"About how nice it would be to own a robot."

CONCRETE: HIGH-TECH VERSATILITY

By RICHARD LAYNE

It has long been known that walls of versatile, inexpensive concrete will shut out frigid Canadian winters and blazing Arizona summers alike. But sky-high fuel prices have spurred energy-conscious builders and engineers to make concrete even more appealing to home buyers. The result? A new generation of concrete technologies geared to fast, durable construction, low cost, and great energy savings.

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