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Techno-Comforts and Urban Stresses—Fast-Forward to One Day in the Life of a Future Family

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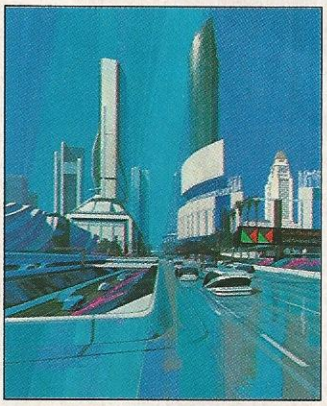


COVER:
Futurist Syd Mead's conception of downtown Los Angeles, circa 2013, looking west on 1st Street toward the Civic Center from San Pedro Street. Story on Page 7.

FEATURES

DEPARTMENTS

A DAY IN THE LIFE

A Family of Four and Their Robots, 25 Years From Now

BY NICOLE YORKIN

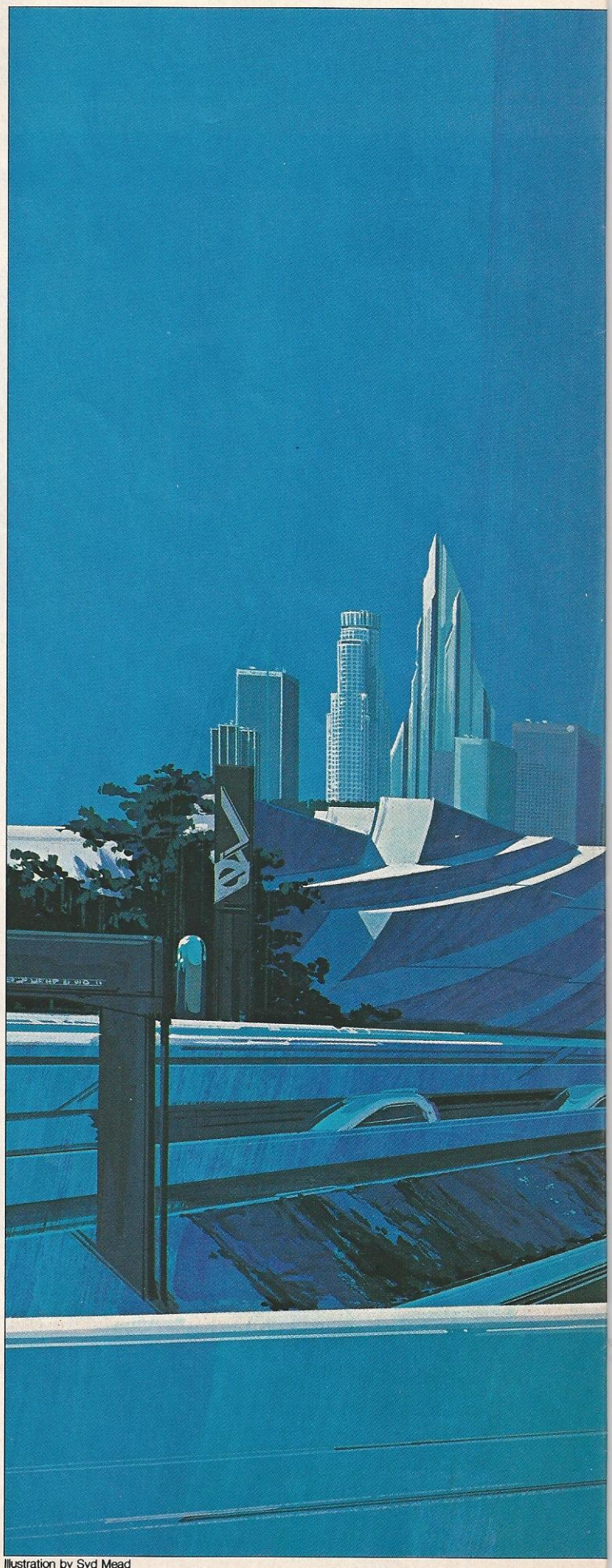


Illustration by Syd Mead

■ 5:45 A.M. ■

IT IS A cold, sunny spring morning in April, 2013. In this area of Granada Hills north of Rinaldi Street, about a third of the residents have already headed out to their jobs, as required by Los Angeles County's mandatory staggered work plan. Many of the remaining households have not yet begun to stir.

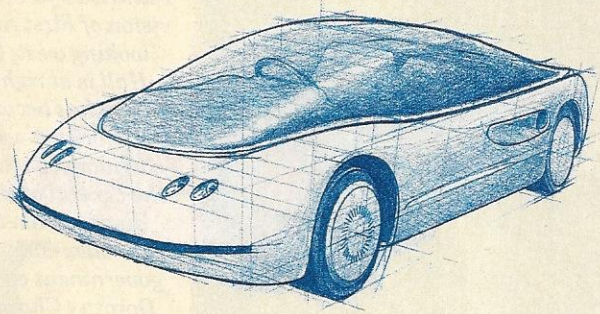
Among the homes on this hilltop is a large, one-story Spanish revival-style house, of the type that was frequently built in this area during the construction boom of the late 1980s. A streamlined cobalt-blue auto is parked in the driveway. The street is still.

■ 6 A.M. ■

WITH A BARELY perceptible *click*, the Morrow house turns itself on, as it has every morning since the family had it retrofitted with the Smart House system of wiring five years ago. Within seconds, warm air whooshes out of heating ducts in the three bedrooms, while the water heater checks to make sure there's plenty of hot water. In the kitchen, the coffee maker begins dripping at the same time the oven switches itself on to bake a fresh batch of cinnamon rolls. Next door in the study, the family's personalized home newspaper, featuring articles on the subjects that interest them, such as financial news and stories about their community, is being printed by laser-jet printer off the home computer—all while the family sleeps.

Futurist Syd Mead's vision of First Street (looking west; City Hall is at right): Street has become a major east-west corridor separating the central business district from the new civic government center. Dorothy Chandler Pavilion, in the distance beyond the civic center, is dwarfed by one of two 200-story mega rises downtown.

Smart Cars



CHANCES ARE THAT in the next 25 years, Los Angeles won't lose its ardor for the automobile. But the cars in which we spend so much of our time will be smaller, more efficient, more automated and more personalized, industry experts say.

"Vehicles will become more suited to the needs of each individual," says John Schinella, director of General Motors' Advanced Concepts Center in Thousand Oaks. "Some will be more utilitarian, more pointed as to what their uses are, but shapes, sizes and needs will be vastly different."

"I think you'll see a lot of special-purpose vehicles," agrees David Turner, director of Advanced Concepts Design for the Ford Motor Co. "There'll still be large and small cars, but there'll be a greater variety of vehicles available, including extremely small commuter vehicles."

For instance, Schinella predicts, we may one day be able to drive around Los Angeles in a "sports-utility" vehicle that can go from being a two-seat sports car to a beach buggy—thanks to a plug-in module. And, Turner says, the variety of models available in these "niche" vehicles will be astounding. For example, consumers will be able to choose from scores of van models—all different. These could include a "starter" van for families, a commuter van that would be the "Lear Jet of the highways," a sedan that could convert into a van and even a van that would handle "like a Mark VII."

Turner says the car of the future will be defined by increased efficiency. By 2013, the engine and mechanical parts of the car will have become smaller, he predicts, leaving more space for people and cargo. Schinella sees autos 25 years from now as slimmer and taller than cars today, with more spacious interiors. Turner believes that aerodynamics will "always drive the shape of the car" and that auto interiors will be "infinitely adjustable." And, he adds, tremendous progress will have been made in automobile safety.

In 25 years, today's new technology will have become standard equipment, both designers agree. Chief among these developments will be a central computer in the car that will control a number of devices. A sonar shield, for example, will automatically brake the car when it comes too close to another. If something malfunctions, diagnostic features will tell the driver what's wrong. Autos will also come equipped with electronic navigation or map systems.* Once the driver programs a destination, the system will pick the fastest route, taking into account traffic information, then give the driver the estimated time of arrival, continually plotting the car's position on a map.

—*N.Y.*

■ 6:30 A.M. ■

WITH A TWITCH, "Billy Rae," the Morrows' mobile home robot, unplugs himself from the kitchen wall outlet—where he has been recharging for the past six hours—then wheels out of the kitchen and down the hall toward the master bedroom for his first task of the day. Raising one metallic arm, Billy Rae gently knocks on the door, calling out the Morrows' names and the time in a pleasant, if slightly synthesized Southern drawl: "Hey, y'all—rise an' shine!"

On the other side of the door, Alma Morrow, a 44-year-old information specialist, is out of bed in a flash. Pulling on some sweats, Alma heads for the tiny home gym, where she slips a credit-card-size X-ER Script—her personal exercise prescription—into a slot by the door. Electronic weights come out of the wall, and Alma begins her 20-minute workout.

Meanwhile, her husband, Bill, 45, a senior executive at a Los Angeles-based multinational corporation, is having a harder time. He's still feeling exhausted from the night before, when his 70-year-old mother, Camille, who lives with the family, accidentally fell asleep with a lighted cigarette. Minutes after the house smoke detector notified them of a potential hazard, firefighters from the local station were pounding on the front door. Camille, one of the last of the old-time smokers, had blamed the accident on these "newfangled Indian cigarettes" she's been forced to buy since India has overtaken the United States in cigarette production. Luckily, she only singed a pillowcase—and her considerable pride. Bill, however, had been unable to fall back asleep and had spent a couple of hours in the study at the personal computer, teleconferring with his counterparts in the firm's Tokyo office. But this morning, he can't afford to be late. With a grunt, he rolls out of bed and heads for the bathroom, where he swishes and swallows Denturinse—much easier and more effective than toothbrushing—and then hurries to get dressed. As he does, the video intercom buzzes. Camille's collagen-improved face appears on the video screen, her gravelly voice booming over the speaker. Bill clicks off the camera on his side so Camille can't see him in his boxer shorts, then talks to her. She tells him she wants him to drive her downtown to finalize her retirement plan with her attorney. Knowing this will make him late, he suggests that Alma could drop Camille off at the law firm's branch office in the Granada Hills Community Center. Camille reluctantly agrees—much to Alma's chagrin—then buzzes off. When the couple heads for the kitchen, they leave the bed unmade: Billy Rae can change the sheets.

■ 7 A.M. ■

DOWN THE hall, 11-year-old Zach feels a gentle tugging on his sleeve. It's his dog, "Max," waking him up for school. Although Zach thinks of him as a real dog, Max is a robo-pet—a mobile home robot less sophisticated than Billy Rae—that Zach has had ever since his bull terrier ran away. Max helped Zach learn to read and now helps him with his math and science homework. This morning, Zach asks his dog to pop a disc of the

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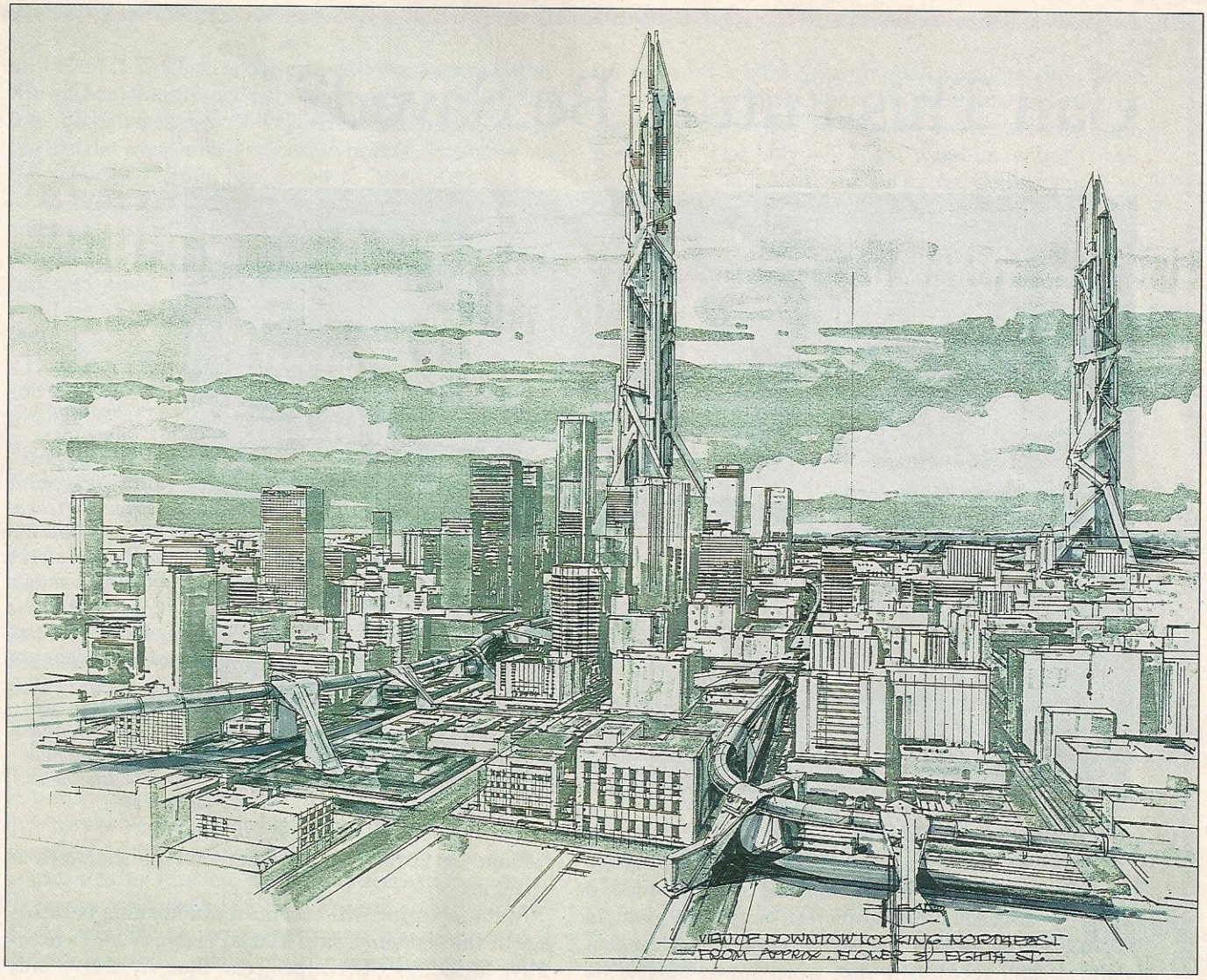
Nicole Yorkin is a Los Angeles writer.

Illustration by Jonathan Wright



Downtown is encircled by Metro Rail tubes and dominated by two earthquake-proof mega rises. Syd Mead envisions structures with hanging floors, supported from the outside by steel beams, that are designed to sway with movement.

Thought Police, his favorite group, into his mini-entertainment unit. Max says he'll do so—but only if Zach puts on a clean shirt.

■ 7:15 A.M. ■

IN THE STARK white kitchen, Alma reads Billy Rae a list of chores she wants him to do today, including polishing the wood floors, cleaning the windows and changing the beds. Billy Rae, who was bought with a Southern-style voice synthesizer because it reminded Bill of his Texas roots, acknowledges the commands with a burst of "Your Cheatin' Heart," and Alma turns away, satisfied. When the Morrows first paid their $5,000 and brought the 4-foot-tall robot home two years ago, neither was sure they'd ever adjust to having it around. In fact, it had taken several weeks—and several near-catastrophes (such as the time Billy Rae pulled down the kitty chow, instead of the oat bran, and served it to them with milk for breakfast)—before they were able to input all the specific information the robot needed to function properly. Now Billy Rae is an irreplaceable part of their lives.

This morning, Bill decides to forgo the cinnamon

Continued on Page 14

The World of Syd Mead

WHAT WILL LOS ANGELES really look like in 25 years? Visual futurist Syd Mead imagines a city characterized by clean lines and high buildings—a crowded, busy place with sleek transportation tubes and few architectural remnants of the 20th Century. Mead's bleak, decaying set design for "Blade Runner" is his best-known portrayal of the future Los Angeles. He's also contributed to such forward-looking films as "TRON," "2010," "Short Circuit" and "Aliens." The illustrations on these pages were designed for a never-produced CBS series called "LA 15." Mead works from his knowledge of technology to ensure that the results aren't too farfetched: "If the images aren't believable, audiences won't relate to them," he says. —*Jill Gottesman*

Illustrated by Syd Mead/Peter Hyams Productions, Inc.

Can This Future Be Saved?

Code-access vending machines, armored post office boxes and drive-up trash disposal bins line downtown streets imagined by futurist Syd Mead. Modern traffic signs are attached to existing light poles, blending old and new technologies.

TWENTY-FIVE years from now, Los Angeles might well be an amazing place to live—a technological utopia, an economic giant, a true world city, a harmonious melding of cultures and races. But that will happen only if we develop strategies to solve a host of problems ranging from crime to pollution to overcrowding.

Population is the primary consideration. Currently 12.6 million, it's expected to reach 18.3 million in the Los Angeles area by 2010. And as the population grows, its ethnic makeup is changing as well, experts say, becoming less Anglo and more Latino and Asian.

The white population is expected to drop from 60% in 1980 to about 40% by 2010, according to recent projections made by the Southern California Assn. of Governments (SCAG). SCAG also reports that blacks will compose about 10% of the population—up 1% from 1980—while Asians will move from 6.2% to 9.3% by 2010, adding about 1 million. Latinos will increase from 24% in 1980 to about 40% in 2010, adding more than 4 million people. These shifts will profoundly affect many aspects of our lives:

■ JOBS: There is little question that the Los Angeles area's economy will continue to expand rapidly over the coming decades. In fact, SCAG predicts that the number of jobs in its six-county region—Los Angeles, Orange, San Bernardino, Ventura, Imperial and Riverside—will increase from 6 million in 1984 to 9 million by 2010. But the character of the work is changing.

Manufacturing will become a diminishing percentage of the economy, says Mark Pisano, SCAG's executive director. SCAG projects that by 2010, only 16.9% of the labor force will work in jobs related to manufacturing, down from 20.5% in 1984. Meanwhile, most new jobs will be connected to service industries, such businesses as banking, real estate, insurance, law and communications. In fact, 29.3% of the labor force will be employed in services by the year 2010, according to SCAG's projections, up from 22.2% in 1984. These industries require a highly educated, white-collar work force, so satisfying this white-collar demand will depend on training Latino and black labor groups—which have been historically under-represented in the white-collar work force.

Thus, one major challenge facing Los Angeles is to somehow match the job skills of the expected population with the needs of the business community. If programs can't be set up to train the local labor force, experts warn, workers will inevitably come in from out of state.

■ SCHOOLS: This ever-increasing and diversifying population will further tax the already-overburdened Los Angeles Unified School District. As of March, 548,987 students were enrolled in the district from kindergarten through high school. Of those, 27% were not fluent in English, district officials say. Another 25%, while

proficient in English, spoke a second language at home. Altogether, the district's students speak some 81 different languages, says Miyeko Heishi, a coordinator in the district's research-evaluation branch. Pressures on the school system are expected to intensify by 2010, when there will be more than 3 million school-age children, according to SCAG. To accommodate this growth, the district will need to build 580 new elementary and junior high schools and 95 new high schools, and hire 31,000 new teachers as well, SCAG statistics show.

■ HOUSING: By 2010, the six-county region will need to add another 2.8 million housing units to today's 4.6 million, SCAG projects. And making affordable housing available to 18 million people will require some creative solutions, planners say.

USC futurist Selwyn Enzer, for one, disagrees with the currently popular slow-growth movement. He believes the region will have to allow high-density housing in some neighborhoods in order to preserve the area's one-family housing areas. Otherwise, he says, density will creep up throughout the city. "We can't control the growth," Enzer says. "High-density areas should get very dense so we can handle the population and keep other areas low-density."

For starters, space and buildings will have to be used more efficiently than they are today, experts say. For example, larger single-family homes could be divided into several sections, allowing more than one family to share the space, or several families might live in one house, sharing kitchen, dining and recreational facilities, says USC architecture professor John Mutlow. There will also be more apartments over commercial spaces, he adds, while multi-generational families might share the same unit with separate living quarters. Mutlow also predicts that home owners will build and rent out secondary houses behind their first houses, which will help them "maintain their life style."

And because many newcomers to Los Angeles will be poor, planners will have to work to prevent some areas from becoming "blighted ghettos," Enzer warns in "L.A. 2000+20: Some Alternative Futures for Los Angeles 2001," published in 1982.

In the coming decades, much of the new housing will be built in outlying areas where land is less expensive but jobs fewer. Therefore, most regional planners believe it is vital to encourage decentralized growth, which would ensure a much better balance of work, housing and shopping in all areas of the region. This will involve urging businesses and immigrants to locate outside Los Angeles' central core, in regional centers—or urban villages—dotting the metropolis.

"Our goal is that they're balanced so people can live, work and play within a reasonable commute distance," SCAG's Pisano explains. Experts hope this will also cut down on freeway congestion and air pollution.

■ POLLUTION: Los Angeles currently has the most polluted air in the country, and given Caltrans' traffic projections for 2010, "the air quality will be worse than it is now," predicts John H. Seinfeld, professor of chemical engineering at Caltech, whose specialty is air pollution. "Not only will it get worse here, but it will spread more substantially to Orange County and San Bernardino," Seinfeld adds.

The region has to develop solutions to the solid- and hazardous-waste problems, says SCAG's Pisano, and the pollution of Santa Monica Bay as well.

■ CRIME: Finally, the spread of crime is also expected to continue here in coming decades. Last year, Los Angeles had the third highest crime rate in the nation, just behind Dallas and Detroit. In 1986, there were 7,406 "index" crimes (murder, rape, robbery, assault, burglary, larceny, motor-vehicle theft and arson) per 100,000 inhabitants here, according to the FBI's Uniform Crime Report.

There are, however, reasons for optimism. Violent crimes are most often committed by young people between 14 and 25, and they will compose a smaller percentage of the population in the next century. By 2015, for example, 12.8% of the people in the region will be between 15 and 19, down from 15% now. USC criminologist Marcus Felson believes the crime rate will also decrease as more people telecommute—working from home part or all of the day—or work closer to home, making their residences less likely targets. And, as the baby boom ages, there will be more retired folks at home, which could deter daytime intruders. Perhaps we'll even have begun to cut away at the causes of crime. The Los Angeles Police Department believes its drug education programs will pay off by decreasing "society's appetite" for narcotics, thus reducing drug trafficking.

"Twenty-five years from now, I see less violence, and that goes hand in glove with getting a handle on narcotics and the gang problem, which I think we'll do well before then," says LAPD spokesman Commander Bill Booth, a 34-year department veteran.

But Pisano has a more philosophical view. He blames the crime rate on the loss of a sense of community here in Los Angeles. "If we have that kind of community feeling—local and regional—then we'll be able to deal with the coming together of different racial, ethnic and economic groups," he says. "If we don't develop a sense of community, all the police in the world won't help."

The key to Los Angeles' future, say the experts, is farsighted regional planning, strong political leadership that involves all segments of the population, and broader coalitions of people working together to solve these issues.

"The future of Los Angeles was not written by the stars," says Enzer, who is also director of the Pacific Rim Data Base for USC's International Business Education and Research Program. "It's not destined to be anything, and even if it were, we could always screw it up." —*N.Y.*

Continued from Page 11

rolls—he's following his company's health and fitness plan—and instead grabs two apples and a glass of milk from the fridge. As he does, the refrigerator "sees" this, thanks to artificial vision, and subtracts the fruit from a running inventory. Bill slathers his face with sunscreen—SPF 40—to guard against the sunlight burning through the thinning ozone layer, then kisses his wife, grabs the printout of his newspaper and heads out the door. He doesn't want to be late for a 9:15 meeting downtown.

In the driveway, Bill slips his plastic key-card into a slot in the door of his pride and joy—the spanking new, custom-built, cobalt-blue Apollo 3000. The car door opens, and the black leather interior automatically adjusts itself to Bill's 6-foot-2 frame. After the power seat, mirror, pedals and steering wheel have moved into place, Bill slips behind the wheel and slides the card into the dash, starting the engine. With a quick check of the car's electronic map system, Bill sees that the Harbor Freeway is like a giant parking lot and decides to take Metro Rail part of the way in.

Coasting down Louise Avenue, he noses his car across Rinaldi, turns left at the stoplight and creeps onto the 118 Freeway East, his commute becoming one of the 58 million driving trips being made on the freeway system today. As Bill slowly drives toward the Golden State Freeway, his eyes start watering, as usual, from the sun and heavy smog. To cut the glare, Bill pushes a button on the dash that automatically tints the windshield as dark as he wants it. How ironic, he thinks, that even with mass transportation, there are still so many cars on the road that the commute downtown now takes three times as long as it did 25 years ago.

There are so many cars that getting downtown now takes three times as long as it did 25 years ago.

Inching along the four miles to the Interstate 5 South interchange, he watches a train of luxury cars in the Electro-lane—the only lane moving—whiz by. He thinks he just might have to have his car fitted with an inductive coupler next year.

■ 8 A.M. ■

BACK IN GRANADA HILLS, Zach is talking with his computer pen pal in China, asking her some questions for his social studies project on life in another country. When the school bus honks, Zach hurriedly signs off without even hearing the answer to whether kids in Beijing listen to futura-rock, too. He plugs Max into the wall outlet to charge up, grabs his "smart card"—a personal portable computer about the size of a 3x5 card, which carries his educational history—and dashes out of the house.

The trip to school is a short one, since Zach attends Christa McAuliffe Elementary School, a small neighborhood public school with only 300 students, nestled at the base of the Granada Hills. Zach's school is part of a pilot program started by the Los Angeles Unified School District to scale down school size and "return the informality of community." Thanks to new technologies such as fiber optics and artificial intelligence, the students' educational opportunities are greatly expanded.

At school, Zach and his fellow sixth-graders walk into their homeroom and plug their smart cards into their "desks." This provides each child with access to a computer having a larger memory and computing powers, and a screen the size of the desk top.

Right after the bell, Dawn Hayden, their youthful teacher, queries each child's computer to see which students actually did their homework. Zach is not among them. Then Hayden tells the students it's time for a lesson in ancient cultures. As she pushes a button, the walls, ceilings and floor of the classroom—all large-screen displays—are covered with a scene from the ancient Mayan city of Tikal in Guatemala. The students find themselves sitting inside a ceremonial plaza circa AD 550, surrounded by flat-top pyramids. When a student asks what Tikal looks like today, Hayden hits a key and the computer generates photograph-quality images of the Mayan ruins, circa 2013, that also cover the classroom. Zach takes advantage of the darkened room to torment Ginny Herrera with his toy ultra-laser. It is quickly confiscated.

■ 8:15 A.M. ■

ON HIS WAY to the living room, Billy Rae drops a load of dirty clothes into the smart washing machine, which measures out the correct amount of detergent and begins the cycle. Meanwhile, Alma turns on the powerful home computer and begins her workday—without ever leaving the study. She began telecommuting back in the '90s when her employer—the same corporation Bill works for—realized it could increase employee productivity, *and* help alleviate the county's tremendous transportation problem, by doing away with long commutes to one central location. Alma avoids rush-hour traffic by working at home for several hours in the early mornings, then heading to a satellite work center, where she shares office space and a support staff with employees from several different local companies. She communicates with her co-workers from home via electronic mail—which allows her to send and receive messages, graphics, illustrations and animated figures over her computer screen.

As an information specialist, Alma, who has a degree in library science, helps coordinate the corporation's strategic development of new markets in the world. She does this by condensing and synthesizing information from data sources all over the globe. Alma can draw on an extensive laser-disc research library, as well. This morning, she has asked the computer to correlate data on demographics, median income, life style and other information about a potential new market.

But just as she begins focusing on the figures, charts and diagrams on her screen, there's a loud noise from the other

room. Alma runs into the living room to find that Billy Rae has accidentally backed into the antique side table, sending glass objects and mementos crashing to the floor. Alma shrieks at the robot—this is the third time this week he's done this! Once again, Alma tells him to clean up the mess.

■ 8:30 A.M. ■

THIS IS ALL I need, Bill is thinking, as his car sits motionless in the gridlock on the Golden State Freeway just before the 101 interchange. For a while, he was really zipping—his digital speedometer clocked him at almost 13 m.p.h.—but that was for only a mile. And it was before the blue-jump-suited police officer stopped the dented old gas-guzzler ahead of him. When the officer fed the driver's thumbprint and license into the squad car's mobile digital terminal, something obviously hadn't measured up. Within seconds, the policeman had handcuffed the offender and sped away in the Electrolane, his prisoner in the back seat.

Finally, traffic starts moving again, and Bill creeps by the thick trees planted alongside the Hollywood Freeway and down the Lankershim Boulevard off-ramp in Universal City. Driving under the overpass, Bill pulls up at the Universal City Metro Rail Station, at the entrance to the massive entertainment complex. He leaves his automobile in the parking structure, then takes the escalator down to the subway platform. Flashing his monthly Metro Rail pass at a uniformed guard, Bill boards the shiny aluminum train for the 20-minute ride downtown to the Fifth/Hill Street Station. As he passes through Hollywood on an elevated part of the track, Bill marvels at the way the neighborhood sleaze has been systematically cleaned up, thanks to massive redevelopment along Sunset Boulevard.

> Camille lets Billy Rae make the enchiladas. But she thinks the robot's cooking lacks a certain finesse.

■ 9 A.M. ■

IN GENETICS 1, Zach and his classmates get a chance to study computer-generated 3-D images of gene combinations at their computer-desks. Led by Ms. Hayden, the students have a chance to experiment with various combinations to see how they affect humans. They're preparing for an afternoon seminar that Zach and his fellow sixth-graders will attend at a nearby genetic engineering lab. Zach, who thinks he'd like to be a rock star when he grows up, spends the period drawing guitars on his "Junior Astronaut" textbook.

Back at the Morrow home, Camille is awakened by Billy Rae, who brings her a banana and her vitamins—the same breakfast she's had every morning for the past 40 years. Camille, a widow, has lived with her son and his family since she retired from her career as a law-office manager eight years ago. Bored within months of retirement and looking at a good two more years of productivity, Camille met with a career counselor and decided to start her own part-time business. Thus, after taking courses in sociology and business at the local university branch, Camille began a second career: matching up families who want to share their single-family homes with another family, rather than move to less expensive apartments. She is proud of the way her service has taken off—thanks to people's desire to hold onto their homes, which are becoming something of a luxury in these days of housing shortages.

After exercising to Jane Fonda's latest "Geriatric Workout" video, Camille asks her daughter-in-law if she can borrow the computer for a few minutes to clear up a banking problem. Camille would rather talk to a teller face to face as she did in the old days, but since it costs $25 extra, she'll make do with video-banking. It's possible because of the Integrated Services Digital Network, which allows the same cables to simultaneously transmit diverse types of information—voice, data and video. These fiber-optic cables, made of flexible glass that carries information sent as pulses of light, have replaced the old-fashioned copper telephone lines.

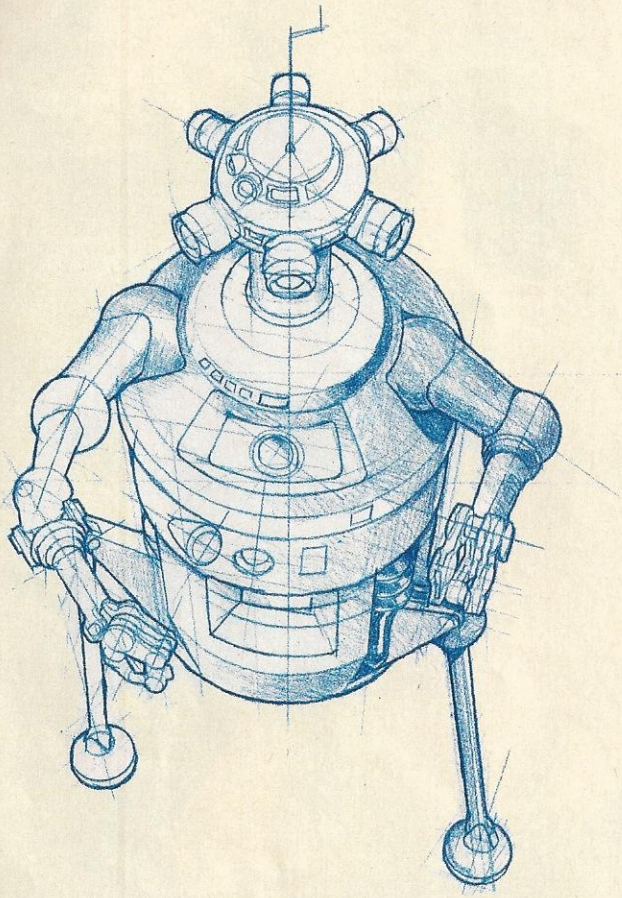
This morning, Camille dials the bank and is put on hold. Because her banking record is linked to her phone number, Camille's account is automatically displayed on a computer screen when a teller picks up the call. On her side, Camille can see the teller's face in a window of the computer. Within minutes, the matter is cleared up, and Alma can return to her project.

■ 9:30 A.M. ■

ON THE ELEVATOR RIDE up to his office—located on the 70th floor of the 73-story Library Tower, until recently the tallest high rise on the West Coast—Bill looks out at a strikingly sophisticated skyline. With the advent of L.A.'s status as a world city and one of the three financial centers of the world—along with Tokyo and New York—the downtown area is as vital as that of either of those cities. Thousands of people live here now—or keep an apartment here and have a house in the suburbs—and it has emerged as a thriving regional center. That's why Bill's corporation, employing some 50,000 people worldwide, moved its national headquarters from New York to Los Angeles at the turn of the century.

Walking through the doors of his plush, airy office—a far cry from the cell-like office configuration of old—Bill greets Cara, his human interface manager. Looking up from her computer phone, Cara tells Bill that he missed his first meeting and that his second meeting is about to begin. Rushing into the conference room, Bill sees his impatient business associates—two Southeast Asian bankers—already seated at the table facing a movie-theater-quality digital screen, which illuminates the entire south wall of the office. They are talking to Joyce Bascomb, the corporation's London vice president, via 3-D video conferencing. Apologizing, Bill quickly puts on his special glasses, and on the screen, Bascomb's image pops into the room as a holograph, as though she were really there. The four launch into an animated discussion about the potential purchase of a Thai textile company.

The Ultimate Appliance



IN 25 YEARS, mobile robots will be a fixture in our homes, say experts in the field. "Robotics are the coming industry of the next century," says computer engineer Frances Lambert. "Having a robot will be like having a really good sound system now."

In fact, convenience robots that can perform a variety of household tasks may start hitting the marketplace by the late 1990s, says Behnam Bavarian, assistant professor of electrical engineering at UC Irvine and director of its Robotics Research Lab.

He is confident that scientists and engineers will come up with the artificial neural networks that will supply the technology needed to build a robot that can mimic human actions. These neural networks will be fabricated from integrated-circuit technology. With them, robots will be able to wash dishes, cook and clean house cook, as well as to speak, synthesize and understand speech and be able to respond, Bavarian says.

With the proper technology in place, robots of the future will be teachable "like a 2-, 3- or 5-year-old kid," he adds. "If they make a mistake, they learn and get better. You don't program them to get better. They just get better."

Robots, which might cost between $300 and $1,000 (in 1988 dollars), would come programmed to perform specified tasks, such as mopping floors, vacuuming or serving food. The new owner would only have to give the robot specific information, such as the house's dimensions, the locations of household supplies and the family schedule. Although it could be instructed verbally, a robot could also be hooked up to a computer to process information. The owner of a new robot would simply buy a floppy disc with the program for washing dishes or, perhaps, cooking pasta, and then download it into the robot.

Because they will be programmed to start themselves, these household robots will probably be easier to take care of than most pets. They'll know the time of day and their schedule and thus know when to rest, when to work and when to recharge themselves.

Bavarian says the robots could look like anything from R2D2 in "Star Wars," to "any cylindrical thing with two arms and light sensors, which will help it to go around." Manufactured from a light, strong material, such as aluminum, these machines could either move on a wheeled platform, walk on two legs or have multiple legs, like a spider, he says.

But robots aren't being designed only for home use. Engineers are working on many different applications for them. For instance, they're developing a robot that could be a companion to lonely or infirm senior citizens; a nurse robot that could talk and monitor a patient's condition and, if necessary, call for medical assistance; a prison guard robot, and a robot horse that could perform heavy labor. Robots will also be used in space, says Bavarian; one project is developing fully autonomous robots for a Mars mission.

"The robot will be a reality in 25 years," he says. "They'll be the next technology item made for households after the PC."

—*N.Y.*

■ 10:30 A.M. ■

SATISFIED WITH her morning's efforts, Alma gets ready to leave for the corporation's San Fernando Valley satellite work center. Meanwhile, Camille, whose turn it is to make dinner, has begun preparing her special lasagna. She is interrupted by Alma, who is impatient to get going. Alma tells her mother-in-law just to load the floppy with the enchilada program into Billy Rae, so he can cook it and they can be on their way. Camille does this, but she's not happy about it. She thinks the robot's cooking lacks a certain finesse.

Climbing into the family's mini-van (a mini-mobile home when they use it for weekend excursions), Alma and Camille drive down Louise Avenue, passing row after row of modest, neatly maintained homes. Alma likes the small-town feel of Granada Hills, as does Camille, who says the city reminds her of Ventura, where she used to live. Turning right on Chatsworth Street, the van heads for the Granada Hills Community Center—the area's central business district and the focal point of the neighborhood. As a member of the citizens' advisory committee that

Illustration by Jonathan Wright

worked on the revival of Chatsworth Street in the '90s, Alma recalls what the four-block area between Encino and Zelzah streets used to look like. Aesthetically, it was drab. There were few restaurants or theaters, and it wasn't a very inviting place to walk.

During its revival, Chatsworth Street's '60s-style one-story flagstone buildings were replaced with a distinctive, Spanish Colonial-style architecture. As part of the renovation, new recreational facilities—including a gymnasium, additional hiking trails and picnic spots—were added to the city's parks to draw people outdoors and foster community pride. Now, as she and Camille head for the Granada Hills Recreation Center, Alma sees a bustling, crowded street punctuated with accountants' and lawyers' offices, bank branches, sidewalk cafes, restaurants and theaters, as well as a university outreach program, the Granada Community Library and stores that cater to the basic needs of this growing community.

Camille gets out at the recreation center—in a park on Chatsworth and Petit Avenue, where her office is. She curtly tells Alma she'll catch the village bus home after her afternoon appointment with the lawyer.

Already late, Alma heads for the Warner Center in Woodland Hills. It's a large regional center similar to downtown or the South Bay, filled with tall office buildings, retail malls and high-density apartments. During the past 20 years, many large corporations have relocated scaled-down versions of their entire operations to places like the Warner Center, to be closer to their employees' homes.

After parking the van, Alma stops for some cash at the bank-teller machine in the lobby of her building. She punches in her I.D. number and then puts her thumb on the screen. After several tries, the machine finally recognizes her fingerprint and gives her two $20 bills with bar codes that verify the money has been issued to her.

In her office, Alma immediately sees two messages on the computer screen via electronic mail—one telling her the marketing meeting has been moved up to lunch, and the second asking her to call Zach's school. She sighs and dials, knowing *that* number by heart.

■ 12:30 P.M. ■

ZACH SITS ALONE in the principal's office, sullenly kicking the chair. Thinking the coast is clear, he sneaks toward the door. Behind him, a man's voice booms out: "Sit down, young man!" Zach turns to see principal Larry Artel's face on the video screen in the corner of the room, a camera watching the boy's every move. Artel, who is based at a school miles away, serves as the principal for several small elementary schools in the district—all linked by telecommunications. He reminds the boy that he's got 30 minutes before he can leave. Zach guiltily returns to his chair, realizing he's not going to escape detention for jamming a fork into the cafeteria robot's electronic eye.

■ 1 P.M. ■

BILL'S OFFICE phone rings as he's eating lunch. "Yes?" he asks. The face of Mitsuru Ito, Tokyo vice president of the corporation, appears in a window of Bill's computer screen. Language translation is automatic

A Quick Look Into the Future

	NOW *(latest figures available)*	2010
■ Population	12.8 million (1986)	18.3 million
■ Portion of U.S. population living in region	1 in 20	1 in 15
■ Ethnic breakdown		
White	60 % (1984)	41 %
Black	9 % (1984)	10.2 %
Asian	6.2 % (1984)	9.3 %
Latino	24 % (1984)	39.5 %
■ Median age		
Male	28.7 (1980)	34.5
Female	30.6 (1980)	37
■ Jobs	6 million	9 million
■ School-age children	2.4 million	3.2 million
■ Population 65 and older	1.1 million (1984)	2.3 million
■ Housing units	4.6 million	7.4 million
■ Average speed, all highways	35 m.p.h.	19 m.p.h.
■ Driving trips made on a typical workday	40 million	58 million
■ Miles of freeway congested during afternoon rush-hour traffic	300	680
■ Time of average freeway trip	15 minutes (1984)	47 minutes
■ Water supply		15 % shortfall

Note: Figures are for the six-county area including Los Angeles, Orange, Ventura, San Bernardino, Riverside and Imperial counties. Data for 2010, the year nearest 2013 for which projections have been done, are from the Southern California Assn. of Governments.

Will Los Angeles Be a Better or Worse Place to Live in 2013 Than It Is Now?

■ MARTIN WACHS, *professor of urban planning, UCLA, and head of UCLA Urban Planning Program:*

IT DEPENDS DIRECTLY on the actions that we take in the next 10 to 15 years. There's a distinct possibility that the quality of life will be inferior if we do nothing—if we continue along the same path with respect to air quality, traffic, the distribution of social services and economic opportunity among the ethnic and class groups, investments in education and so forth. We have an opportunity to make L.A. the leading city in the world at that time if we're committed to doing something about it. I think the answer to that question is "maybe," and it all depends on what we do. The single most important factor will be political leadership.

■ DAN GARCIA, *president, Los Angeles City Planning Commission:*

IT DEPENDS ON the quality of leadership we get. I think that the public awareness and response to the critical issues of the day and their perception of them will have a great bearing on how the future will turn out. We need good schools and education, we need good transportation systems, including mass transit, and we need to prepare for the coming population growth in an intelligent fashion. If we don't do any of those things, the region will be a disaster.

■ SELWYN ENZER, *director, Pacific Rim Data Base, USC International Business, Education and Research Program; past associate director, USC Centers for Future Research:*

IT'S GOING to be a better place. There'll be a lot of things about it that aren't as good as they are now; from a pure quality-of-life picture, it might have been better here 100 years ago. But L.A. is going to be a very dynamic and exciting place—an international city, one of the great ones of the world.

It may be crowded, congested, have high crime rates. . . . But, like anything else, there are goods and bads, costs and benefits. I'd love to be able to be in that exciting city at that time.

■ MARK PISANO, *executive director, Southern California Assn. of Governments:*

L..A. WILL BE a better place in 2013. When you have the opportunity to define the life style of the future, I think we'll be a pattern for the rest of the world—and when you're as creative and innovative as the people of Southern California and Los Angeles, I think we'll be successful. Also, given the capacity of this area to generate wealth through the robust economy that we have, we're going to have the resources to make it a better place.

The only question is: Will our public and private leaders lead? Having worked with them enough over the past several years, I'm convinced they will. And the other test of our success will be the extent to which we bring all of the segments—racial, ethnic, different age groups—into that leadership process. And again, I'm convinced we'll do that.

■ MARCUS FELSON, *associate professor of sociology and senior research associate, USC Social Science Research Institute:*

IT WILL BE a different place. Some people will look back and say what a bore it was—*now* it's a real city; and some people will say, I liked it back then.

The people who think anti-development are fooling themselves, because the cat is out of the bag. It's ridiculous now that we have enough people and no way to move them around. You can't stop now, having created the contradiction. It can't get denser and denser without mass transit, but now it's too expensive and spread out to have a mass transit system, so there's no solution besides spreading out work and minimizing trips.

More development will reduce the load on the system, if the development helps reduce the commute. If they do some very creative things—business and government—then we may look back at this as the congested period and then, things got peaceful again. If they do apply what we've learned about designing out crime and designing in community, and if they apply those lessons creatively, then things will be much better.

■ GLENN F. BLOSSOM, *city planning officer, Los Angeles City Planning Department:*

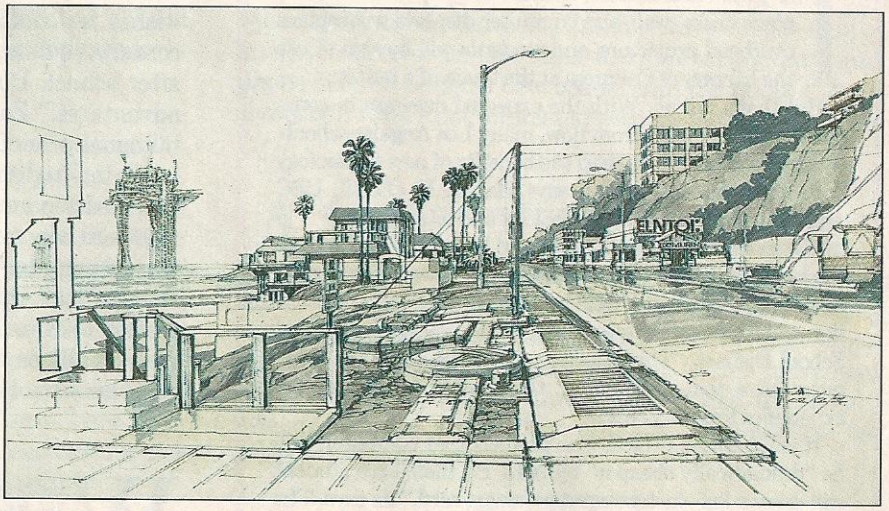
PLANNERS ARE always optimists. Since we're working to make the city better, we have confidence that our efforts will be productive and that we will make a difference and that some of the most pressing problems of today will have lessened. For example, that we'll make a dent in the homeless problem and have fewer people sleeping in the streets; that we will have a better balance in our communities between jobs and housing so there's less need for long-distance commuting; and that we'll be successful with ride sharing and public transportation, so that there'll be more persons per vehicle and therefore proportionately fewer vehicles.

We're also looking at the design of our commercial areas so there are more pleasing, less garish, less inharmonious developments, and are paying more attention to blending the new with the old. —*N.Y.*

as Ito's voice is transmitted over the network. Bill sends Ito a copy of the contract to buy the textile company, and together they sift through the fine points on their screens, rearranging paragraphs and figures, until each is satisfied. Afterward, Ito, who is calling from a supersonic jet en route to Los Angeles, asks if they can meet when his plane lands. Instead, Bill invites Ito and his wife, Michiko, to the house tonight for a home-cooked American meal. Ito says he would be delighted.

Realizing he's late for his mandatory 20-minute workout—as stipulated by the corporation in his employment contract—Bill rushes down to the company's exercise room. Stepping onto a treadmill, he slips his X-ER Script into a slot on the side and dons an exer-helmet. "Today your options for exercise are casual, extensive or exhaustive," the machine intones. "Casual," Bill says. Immediately, he finds himself jogging leisurely along a beach in Hawaii, enjoying the scenery through the screen built into the helmet.

Bill's exer-helmet flashes scenes of a Hawaiian beach as he does his mandatory 20-minute workout.



Pacific Coast Highway at Santa Monica beach is devoid of overhead utility wires in this Syd Mead projection; the wires run beneath grills such as those in the foreground.

■ 1:45 P.M. ■

AFTER HER meeting at the law firm's branch office, Camille has a cup of coffee at the local cafe with her friend Rosa Juarez, who heads the Granada Festival, an annual week-long series of activities, parades and pageants celebrating Granada's cityhood and its sisterhood with Granada, Spain. Rosa tells Camille there will probably be a lot of eligible retirees in town for the festivities. Camille would like to get married again, if only to move from her son's home, but thinks she'd rather try a younger man this time.

■ 2 P.M. ■

BACK AT THE Morrow house, Billy Rae has finished the beds, the windows and the mopping. The robot has collected the mail and dusted off the entertainment center. All that's left is to put the enchiladas in the oven. As he lifts the pan, it slips out of his grasp and shatters on the floor. Billy Rae doesn't notice and shuts the oven door. With nothing else to do, he wheels to the corner and turns himself off. The phone rings in the empty house.

Bill is trying to locate his wife to tell her about the dinner guests. Unable to reach her either at home or the office, Bill leaves Alma a message at the house via electronic mail. As an afterthought, he calls the house through the network and asks the system what kind of food is in the refrigerator. Almost instantly, a readout of the running food inventory kept by the fridge appears on Bill's computer screen. Seeing they're low on vegetables, salad materials and chicken, Bill tells the system to phone the market and have those items delivered.

■ 3 P.M. ■

AFTER ZACH'S detention, an irritated Alma drops her son off at the recreation center to do his homework at the video library and then drives back to work. Despite Zach's aversion to schoolwork, he enjoys working with laser discs because "it's like watching TV." For a project on John F. Kennedy, Zach reads through the encyclopedia, which is also on laser discs—similar to the compact discs that used to be used for music. Next he pulls out a disc on Kennedy's life and pops it into the side of the computer. Now, as he watches the screen, Zach not only reads Kennedy's words but also sees and hears Kennedy making a speech, which gives the 11-year-old a much better understanding of a president he has only heard about.

When that's finished, Zach does his art history homework by "walking" through the Louvre museum in Paris via laser discs that contain the museum's entire collection, systematically arranged. The simulation of the "Mona Lisa" is so good that Zach almost feels he's there.

■ 4 P.M. ■

BACK IN HIS office, Bill takes advantage of a moment of quiet before his visitors arrive to buy a new suit. Calling up his suit manufacturer in Burma, Bill asks to see what styles the company is showing this year. Instantly, photos of suits appear on his computer screen showing various colors and fabrics. Bill then orders the style and material he likes. The suit will be laser-cut to his shape (the company already has his measurements) and will show up by the end of the week.

Meanwhile, Camille and Zach arrive home on the village bus to find a repairman standing on the front stoop trying to persuade an intransigent Billy Rae to open the door. It seems the clothes dryer had a short in its circuitry and notified the manufacturer to come to the Morrow house to repair it. Since Billy Rae has been programmed

High-Tech Teaching

IN THE classroom of tomorrow, computers will replace desks, wall-size computer displays will replace overhead projectors, and students will be able to use the Library of Congress at the touch of a button.

But that's not all. With the expected decrease in computer prices 25 years from now, many Los Angeles schoolchildren will be able to reap the benefits of new technology both at home and school, says Harold F. O'Neil, USC professor of educational psychology and technology.

"Learning will take place in three locations—the school, the home and the community," agrees Harry Handler, an adjunct professor in UCLA's Graduate School of Education and former superintendent of the Los Angeles Unified School District. "The objective should be using the computer as a tool in learning; this should be a common experience for every child."

It will be, says O'Neil, who predicts that computers will be "dramatically cheaper" by 2013. By then, each student will carry a 3x5-inch computer "smart card," he says. The card will be a battery-operated computer that will have the student's educational history, as well as a list of all the skills the student has mastered, stored in its memory.

To do homework, the student will plug the card into a home computer, which will later update the smart card's records to show what the student has completed. Back at school, students will plug their smart cards into their desks, more powerful, voice-input computers whose entire surface will serve as the screen, says O'Neil.

These new "desks" will have an added advantage, he adds. They'll solve the problem of students and teachers not speaking the same language in the classroom. Thanks to the voice input and output on these computers, there will be an instant translation on the computer screen from English into any other language, or vice-versa, as a student or teacher speaks.

O'Neil also foresees a classroom 25 years from now in which the wall, ceilings and floors are giant computer displays, much like the kind we see today at football games.

Another major innovation in education by 2013: Knowledge will be readily available to everyone, thanks to such developments as CD-ROM. This technology—which stands for Compact Disc Read Only Memory and is now being used in the music industry—will play back any kind of computer data, including text, pictures and numbers, explains Carl Stork, director of marketing for the CD-ROM division of Microsoft. The entire Library of Congress could fit on one laser disc 25 years from now.

O'Neil stresses that while private schools and wealthier public schools almost certainly will use the new technology, it will be up to public policy makers to ensure that less-fortunate students, too, have access to it. He likes the idea of providing high-tech classrooms for children at risk of dropping out and using it in magnet schools. It's important to begin such policy discussions, now, he says, so that when the technology is widespread and inexpensive, schools will be ready to put it in place—fairly. —*N.Y.*

not to open the door to strangers, Camille finally has to send Zach through the dog door (left over from his bull terrier) to let them both in. When she sees the enchiladas on the floor, Camille punishes Billy Rae by sending him to a closet and locking the door. She's fed up with this mechanical maid.

After a quick snack, Zach and Camille retire to the study for Talking Japanese, a daily Japanese-language class taught at the high school. The two are taking the class via the remote terminal in the Morrow home. Sometimes Zach wishes he could have been born before the turn of the century, so he could just watch "The Flintstones" in peace after school. But his parents want him to have "all the advantages." Zach and his grandmother use a video disc bilingual pronouncing dictionary, so when they look up a word in English, it retrieves the Japanese equivalent in both written and spoken forms, along with pictures showing them how to position their lips and tongues to make the correct sounds. When his grandmother's not looking, Zach tries to look up the dirty words. However, he has good reason to concentrate on his real lessons: Zach is tested periodically on his vocabulary and the exams are forwarded to his school via electronic mail.

■ 5:30 P.M. ■

WHEN SHE returns home, Alma is anything but thrilled about the imminent dinner guests and wasted enchiladas. Tomorrow is her mandatory sixth week retraining session, and she'd been hoping to prepare for it tonight. She's stressed out as it is, and the last thing she wants to do is cook dinner. Alma lets Billy Rae out of the closet and decides to use the Cooking Tutor. Sitting at her terminal, she phones the massive culinary data base and tells the screen she's looking for an easy-to-make dish using chicken and vegetables. Within seconds, the tutor appears on the computer with a custom-designed menu for the night's meal. After rejecting several choices as too time-consuming, Alma selects a pasta dish and follows the steps, with Billy Rae filling in as her *sous chef*.

Moments later, Camille comes into the kitchen to see whether Alma minds if she changes the wall art before the guests arrive. This is the last thing Alma cares about, and she tells her mother-in-law to do whatever she wants. Going into the den, Camille calls the local library branch and tells them she wants to scan every Claude Monet on file. Watching the paintings in the library's file on the screen, Camille decides she'd like Monet's "Water Lilies," because it reminds her of Ventura. She then tells the computer to store that image and project it on the wall—which is a large-screen display. Thanks to the new technology, the picture is so clear, so dense, that it actually *looks* like a giant Monet painting.

■ 6 P.M. ■

BECAUSE HE'S in a hurry, Bill gets clearance to take the company helicopter to Universal City with his Japanese guests. As the chopper lifts off the helipad atop Bill's office building, he looks out the window, shaking his head at the gridlock below. Even though drivers are charged extra to drive into the downtown area, automobiles jam the streets. The helicopter crosses the Harbor

Freeway and trails the Hollywood Freeway up to Universal City where Bill's Apollo is parked. His guests assure him the traffic is nothing compared to Tokyo's.

■ 7 P.M. ■

AS THE STOVE automatically cooks the pasta, Billy Rae rolls the kitchen counters to one end of the room, creating a small dining area. Everything in the room is flexible in order to create separate work and eating spaces. Alma, who supervises Billy Rae, downs a few aspirins before the guests arrive. She can't wait to tell Bill what trouble their "mentally gifted minor" got into today.

■ 8:30 P.M. ■

THE DINNER has been a success. The Itos complimented Alma on her wonderful food, and asked her to send the recipes to them over the network when they return to Tokyo tomorrow. After the meal, the Morrows entertain their company in the rec room by calling up the local digital music cable company and asking to sample a few classical selections. Music pours out of the speakers attached to the side of an ultra-thin, high-resolution video screen hanging on the wall. Ito likes one symphony so much that Bill records the whole piece on a laser disc, telling the cable company to bill his bank account for the recording, and gives it to Ito as a gift.

■ 9 P.M. ■

EXHAUSTED FROM the day, Alma suggests that they all watch a film, secretly hoping her guests will want to go to bed instead. Everyone likes the idea, however, so Alma calls the cable company to ask what's available. Trailers for 10 different films appear in 10 different windows on the screen. The group selects "Blade Runner," an "oldie, but goodie."

■ 11 P.M. ■

FINALLY, THE Itos have left to stay at a local bed and breakfast and Zach has gone to bed, giving Bill a chance to call England to get an update on the negotiations for the Thai textile company.

While her husband works in the study, Alma relaxes in bed by popping a laser disc of the "Collected Works of Jackie Collins"—a selection from her Library of the Month Club—into her laptop computer. It's been a long day. Meanwhile, in her bedroom, Camille takes a deep drag on another cigarette as she talks to Rosa on the computer phone about a possible new beau. From the photo Camille shows her, Rosa's not impressed with his looks.

■ 11:45 P.M. ■

AS ANOTHER day finally beats a long-awaited retreat, Bill and Alma lie in bed discussing whether they should cut back on Zach's cable watching until his grades improve. Alma's not sure. For now, she just wants to sleep. Groggily, Bill takes his Smart House remote controller and punches a few buttons. In one movement, the house lights turn off, the doors lock and the security system and fire alarm click on. The Morrows are fast asleep within minutes.

■ MIDNIGHT ■

FINISHED WITH the kitchen, Billy Rae quietly wheels himself into a corner and plugs himself into the outlet to recharge his battery.

Suddenly, the smoke alarm goes off in the house—and fire engines can be heard approaching from the distance. Bill snaps awake. Who ever said life in the 21st Century was a breeze? He reaches for his robe and heads for his mother's room. —

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Social Trends

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Futurists

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