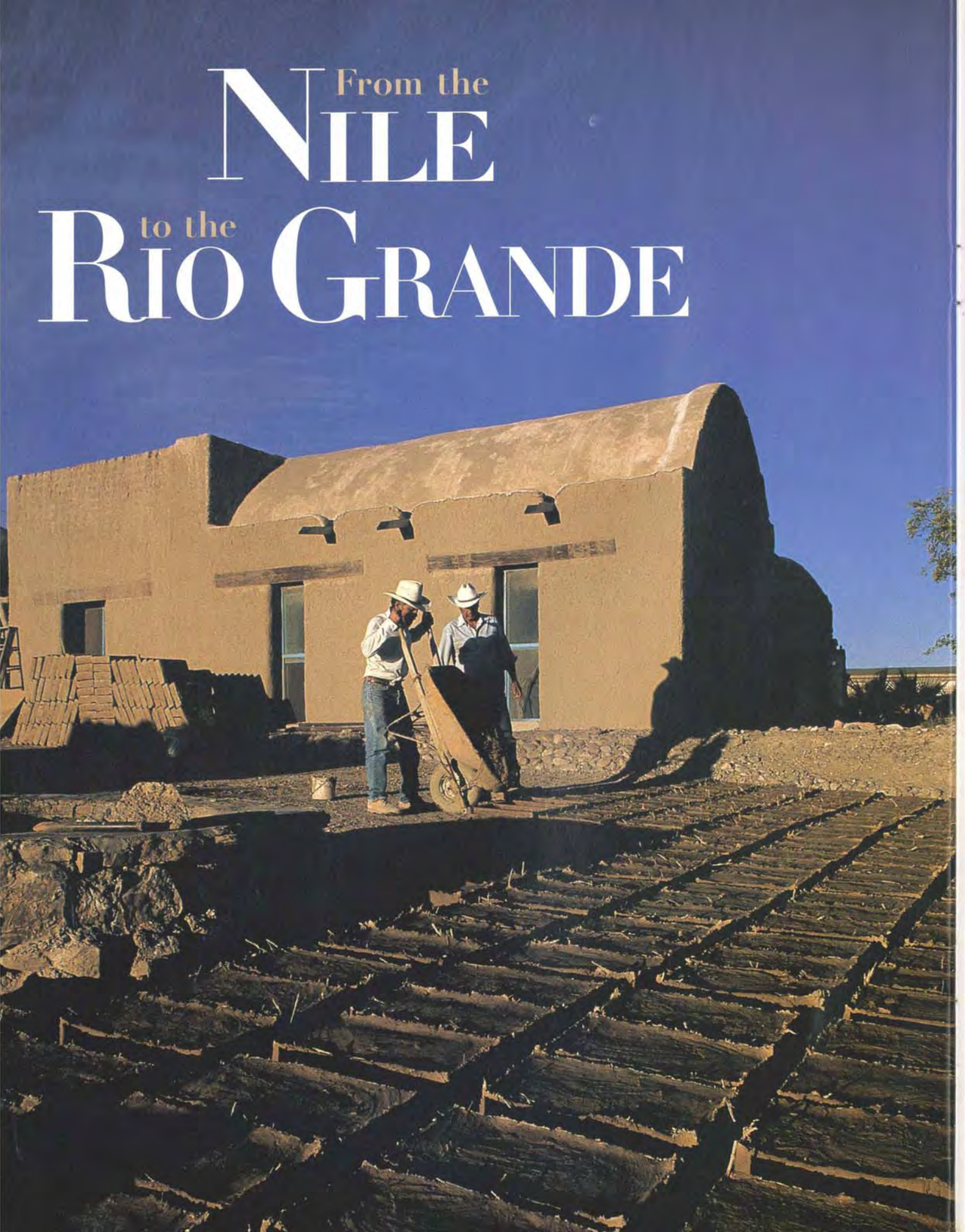
From the NILE to the RIO GRANDE



Written and Photographed by Dick Doughty

When Daniel Camacho bought a diminutive plot of land in the town of Ojinaga, Chihuahua, along the US-Mexico border, in 1994, he had never heard of Hassan Fathy. Like others in town, he did daily battle against a local unemployment rate just shy of 50 percent, working when he could as a field hand or laborer and at odd jobs. He figured it would take a few years to save enough cash to build the walls of a two- or three-room home made of cinder blocks. Later, he hoped, he would find a way to buy *vigas* (unmilled timber rafters) to hold up a roof of corrugated metal.

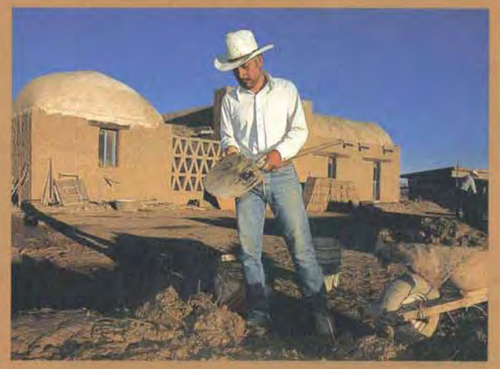
One evening late that year, there was a neighborhood meeting at which a woman from "the other side"—the United States—showed pictures of adobe houses. She claimed they could be more comfortable, more spacious and yet less expensive than the cinder-block-and-sheet-metal houses ubiquitous in the poor sections of Ojinaga. She also claimed that the adobe homes might not need expensive air conditioning, even through the fierce Chihuahan summer.

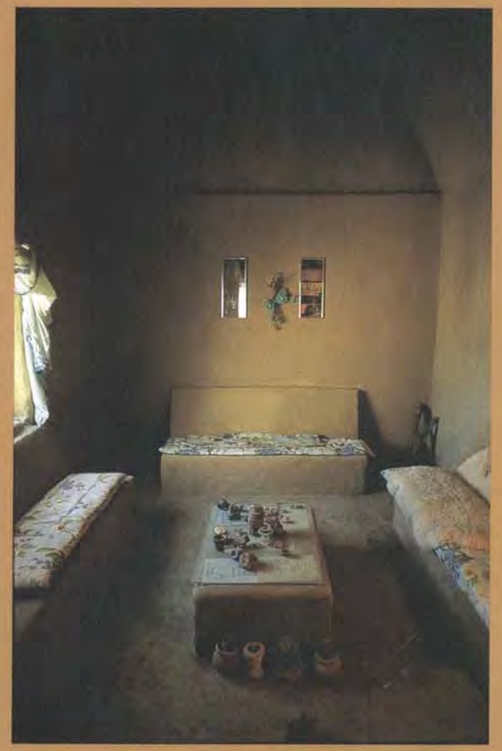
Camacho was intrigued. Adobe was nothing new to him, of course: It had lent architecture in northern Mexico and the southwestern US a distinctive look for nearly 500 years—until the cinder block came along in the 1950's tagged as a "modern material." But what made these adobe houses different from what he had seen was their catenary-vaulted ceilings that used no wood, and didn't even require wooden forms to construct. Although it had never appeared in the western hemisphere, Camacho learned, the design, and the technique of building it, were more than 3000 years old. They came from Egypt, having been revived recently by Hassan Fathy.

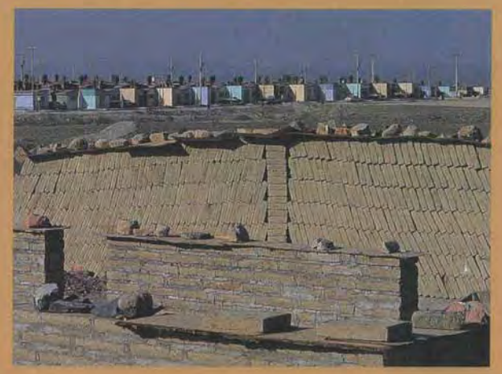
Afterward, Camacho approached the presenter and told her, "I have some land. I need a house, but I don't have a steady job. If you'll give me the materials, I'll help build the house. Then you'll have a prototype, and you can have people visit it whenever you want."

In November 1995, after building for eight months under the tutelage of a local adobe mason, Maria Jesus Jimenez, Camacho moved into his new house. Since then, he's hosted dozens of visitors from around the town and, indeed, the world. Neighbors and housing administrators from both the US and Mexico, as well as architects, professors and reporters, have come to see the house. The four-room home's plan is T-shaped, and two walled courtyards complete a rectangular compound.

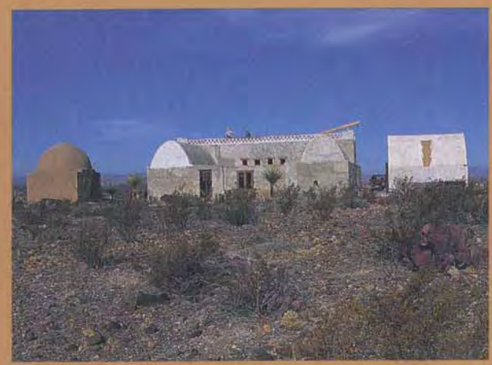
Inside, on a hot May afternoon, it is comfortable. It smells of earth. Camacho says he doesn't have an air conditioner, because the heavy walls and ceiling absorb heat in the daytime and radiate it at night, moderating indoor temperatures, much like a small cave. (See *Aramco World*, May/June 1995.) Although the kitchen measures only a bit

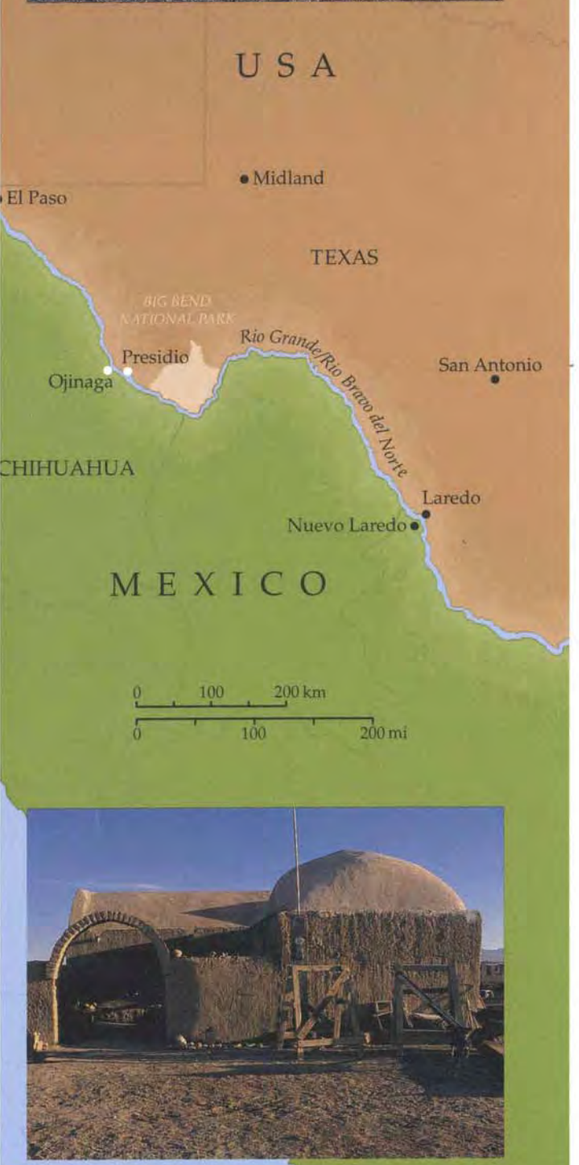






Top and opposite: *After Daniel Camacho made the adobe bricks with which he built his own house in 1995, he became one of a handful of cottage-industry manufacturers in Ojinaga.* ***Center:*** *In his vaulted living room, three couches and a coffee table are built in.* ***Right:*** *Camacho's bricks await buyers. Though the houses in the background are both less spacious and more expensive, they remain more popular because they can be purchased with generously subsidized loans from the Mexican government.*





more than three by three meters (10x10'), its domed adobe ceiling not only increases the sensation of space, but gracefully transforms the room into a simple shrine to the rituals of food. His vaulted living room, though narrower than a railroad car, is also deceptively spacious. Its three cushion-covered sofas, coffee table and bookshelves are all built in, made of the same plastered adobe as the walls. They all make the room appear hewn from stone.

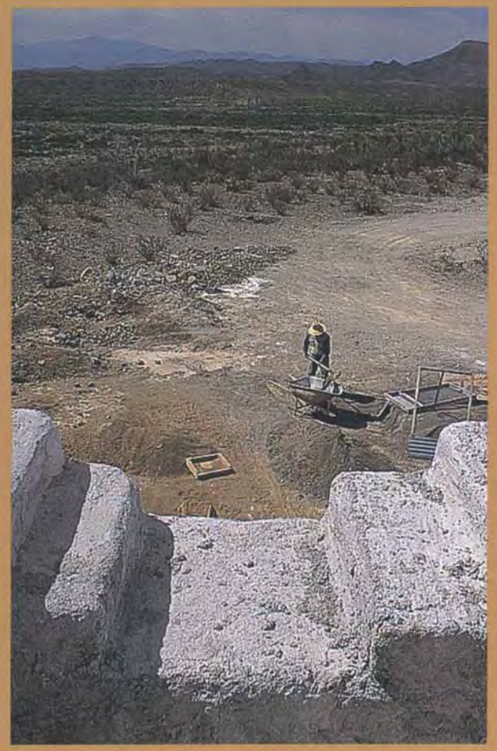
Only a few hundred meters away lies an assembly-line row of government-sponsored cinder-block homes, sobering reminders of how innovative Camacho's house really is. Each is half the size of his 50 square meters (550 sq ft), but cost roughly three times the $5000 that Camacho's did. However, the buyers of these homes benefited from government-backed, low-interest credit, something not generally available. Without such arrangements, lending rates in Mexico can run to 48 percent, and it is this that has so far prevented some 50 families who have expressed interest in Camacho's design from building.

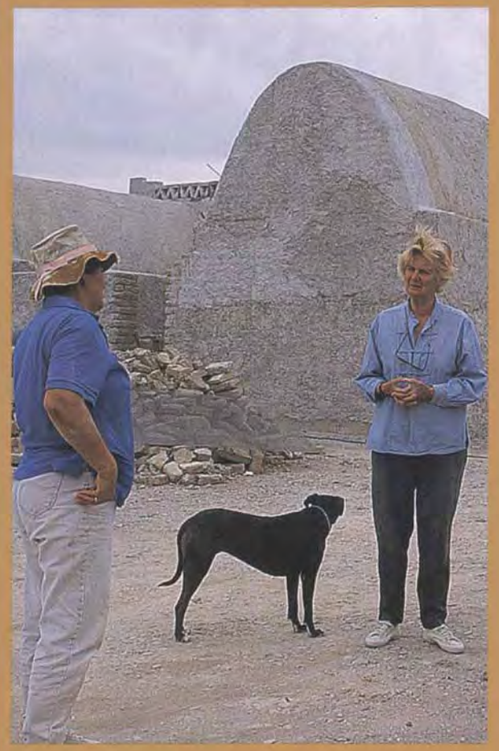
From one of his built-in shelves, Camacho pulls a dusty, worn photocopy of *Arquitectura para los Pobres*, the Spanish-language edition of Hassan Fathy's 1969 *Architecture for the Poor*. "This book is something very important," Camacho says in a gentle voice. "Our population keeps growing and growing. We have to look for a solution, and it has to be something right here in front of us, in the natural resources that the poor can afford. I've read it all. I respect Hassan Fathy very much."

Camacho heats water to make instant coffee. Mud is embedded in the deep creases of his hands, and here in the desert the sweat dries before it can shimmer on his lithe neck and chest. He has spent the day spreading shovelfuls of dry earth and mixing it with water and straw. The mixture will sit until morning, when he'll add more water to it and, from that mud, form bricks. Since finishing his own house, Camacho has become one of several adobe-brick makers in Ojinaga. He employs two other men—when he has orders—and though they can each mold up to 200 bricks in a day, they sell only about 4000 to 5000 in an average month. He makes two sizes of brick, a large one for walls and a smaller one for roofs. The difference, he explains, is that lighter bricks are needed to form the vaults and domes. The proportions of the bricks he makes are similar to those used in ancient Egypt and in much of the Middle East, the same proportions introduced to the New World by the Spanish, who had learned to work with adobe during the centuries of Arab rule in al-Andalus.

Outside, he pours water onto the piles of earth and beats straw into the viscous mixture with his bare feet—about three bales per 1000 bricks, he says. The straw will reinforce the adobe internally, much as steel bars do when set within concrete. Tomorrow, one of his workers will help him mold the mixture by hand. He'll use one of two wooden forms, either the one that forms three wall bricks at a time, or the one that forms six roof bricks. They'll pour the mixture from a wheelbarrow into the mold and smooth it by hand; then they'll lift the mold away and rinse it for the next set of bricks. After two days the bricks will be propped up on one side to dry more evenly, and after four they will be stacked to await a buyer. A good

Above: *Simone Swan's Texas-side house uses four Nubian-style catenary vaults in an H-shaped plan. The crossbar of the H has a flat observatory roof supported by unmilled timber rafters. Right of the house is a vaulted solar power-house and storage shed; to the left is a domed guest room.* ***Left:*** *Camacho's house is entered through an arched gate and a small yard. Directly behind the gate is the vaulted living room. The domed kitchen is on the right: The dome's irregularity is similar to what Fathy often found in vernacular Nubian architecture.* ***Opposite:*** *One of the two bedrooms in Swan's house.*





adobe maker, Camacho points out, is one whose bricks consistently carry the optimum proportion of mud and straw.

As Camacho treads straw and mud, he can look north across the Rio Bravo—called the Rio Grande in the US—to what from his distance appears as no more than a smudge on a scrubby hill. This is the region's second Fathy-style home. Camacho supplied 18,000 bricks for it, and the mason who taught him, Maria Jesusita Jimenez, is working there now. The home's owner and resident is Simone Swan, whose presentation to Camacho's neighborhood group was an early program of the Swan Group, dedicated to introducing both Fathy's philosophy and—as applicable—his techniques to the Rio Grande/Rio Bravo valley. A self-taught architect and lifelong student of the arts, Swan spent three years in Cairo as an assistant and student of Fathy's. (See page 16.)

She recalls it was in 1990, during the memorial celebration for Fathy that she organized in New York, that she "came to a conclusion of significance." She thought of the awards Fathy had received and the countless articles, books and seminars his life's work had spawned. "But who, I wondered, was carrying out his most vital wish, the very task of helping the poor of this world to be housed decently? No one was doing the work! I resolved then, quite simply, to continue it myself. I was aching to do hands-on building, and to realize materially the learning I had acquired."

But where to carry out such a mission? For Swan, raised in the US and central Africa, educated in Europe, a former director of the Menil Foundation in Houston and a long-time resident of New York, it could have been anywhere—and that was part of her dilemma. The next fall she took a vacation to Big Bend National Park in Texas. En route through Presidio, Swan caught sight of the historic adobe Fort Leaton being restored on the outskirts of town. "I was just dying to get my hands on adobe," she says, and the next spring, she found herself volunteering on the project.

"Of course, once I was there I talked about Hassan Fathy this and Hassan Fathy that, and pretty soon they asked me to do a demonstration of the vaulting I kept talking about. We invited several local masons, and one was a woman who kept very quiet but I could see that she was just watching, very intelligently, less skeptically than the others." She was Maria Jesus Jimenez, a soft-spoken mother of three who says she finds "great contentment" in masonry. Later, while Swan taught her all she could, Jimenez helped introduce Swan to the community. Together they formed the Swan Group to serve the broad, binational valley, where the parched rattlesnake mountains and the hardscrabble population both bear a remarkable resemblance to those of Upper Egypt.

On an early summer afternoon, with the thermometer pushing 41 degrees centigrade (106°F.), Swan's kitchen is pleasantly warm. Above, a vaulted ceiling traces the catenary arch that peaks at 4.4 meters (14½'), giving the three- by eight-meter (10' x 25') room the feel of an old Middle Eastern market. But this ceiling is disconcerting to an eye accustomed to the plumb verticality of Roman and Gothic vaults: The parallel courses of bricks, which Swan has left unplastered to reveal the technique in use, list off plumb like a less-than-full shelf of books leaned casually against a bookend. The effect imparts a sense of motion that belies its own physics, as if the thrust and weight of the vault is not straight down into the walls—as it truly is—but rather along the length of the room toward the rear wall, like a string of dominoes frozen in mid-fall. On the other side of the H-shaped house, the vaults over her bedroom and the guest room are much the same. Yet all of them, like their countless millennium-old archetypes in Nubia, will likely long outlive the masons who raised them.

Building catenary vaults is "something you get a feel for," says master builder Mauro Rodriguez, who joined Jimenez in the task. "Each vault goes up just a little different, each course is a little different, and that's okay so long as it stays even over the full length. Even each adobe [brick] can be a little different, too. Have you ever looked at a wasp's nest?" he asks. "They build their nests just the way we make these vaults. I think that's where [the Nubians] must have first learned this."

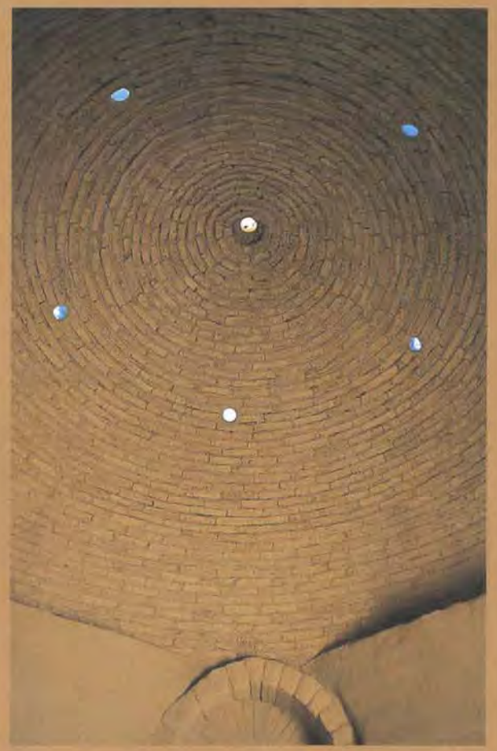
Swan is building her home, which she coolly calls "Prototype Two," some 15 kilometers (10 mi) outside Presidio on a rolling, cactus-strewn mesa of 175 hectares (430 acres) that she hopes, someday, to develop with more homes built on Fathy's principles. But her sights are set first on local low-income adobe housing. As her crew labors on her house, she labors in her office opposite the kitchen, sketching plans, sending reports, soliciting testimonials from engineers and seeking contact with micro-credit lenders and philanthropic foundations. Over the past year, she has worked to convince the Rural Housing Agency (RHA) of the US Department of Agriculture to give the Nubian vault a federal stamp of approval, and this bureaucratic feat promises to allow Presidio residents to receive low-interest mortgages to build all-adobe homes. With further assistance from a development bank, there are now three houses in the planning stage, and a clinic.

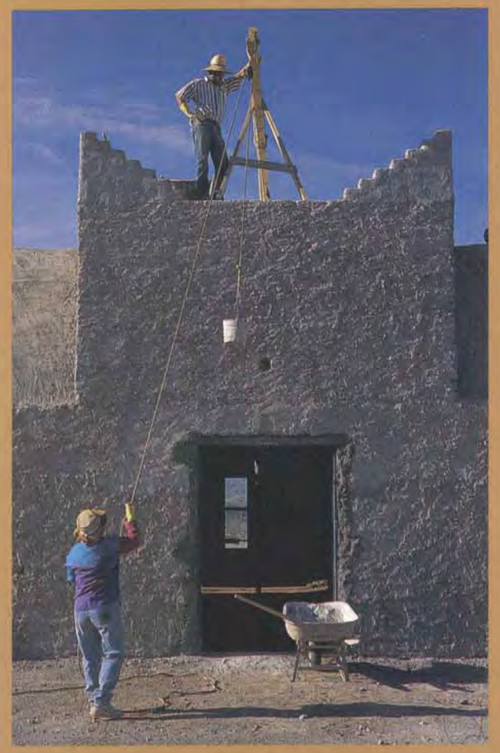
"Not many engineers have studied adobe," says Demetrio Jimenez, director of the non-profit Greater El Paso Housing Development Corporation, who has helped Swan navigate the channels of the RHA. "Even fewer have heard of Hassan Fathy or these parabolic vaults." And low-income people, he explains, can't get government-backed loans without an engineer's approval of the house design. "When that engineer signs off, he has some big liabilities if anything goes wrong. They don't sign on something they don't know," he explains. "But from my experience along the border, there's a lot of families building their own homes anyway; that's just the way people do it here." Swan's ideas thus "lend themselves excellently" to existing local practices.

Swan's own house is now finished, although her artist's touch and commitment to locally produced materials put it about a year behind her original schedule. She added a freestanding, square guest room with an elegant dome, and a utility shed to house the batteries that power the home, recharged daily by a freestanding photovoltaic array. Recently she has spent more time than expected receiving reporters and photographers: the *Houston Chronicle*, *Texas Architect*, *Preservation* and *Texas Co-op Power* have all produced features on her work, which has given her a much-needed publicity boost.

"Now I know I ought to dress up and go to some foundations to see if there isn't someone who can extend micro-credit to people, underwrite an efficient office, help organize teams of owner-builders and so on," she says, "but I just haven't had the time. I'm just one person here. I don't have a staff. But now that the house is finished and we have prototypes on both sides, I can really concentrate on the low-income aspect, which of course is the heart of all this."

__Top:__ Desert scrub stretches toward a rugged horizon from Swan's house, where Mauro Rodriguez mixes finishing plaster. __Bottom:__ Swan and mason Maria Jesus Jimenez talk over the day's progress. Jimenez hopes to build her own adobe home nearby on the same principles as Camacho's and Swan's. __Opposite, top:__ The dome of Swan's guest room is perforated and illuminated by recycled glass bottle-bottoms. Throughout the construction, she has obtained her materials locally. __Opposite, lower:__ "I'm just one person here," says Swan, photographed in her kitchen. "I don't have a staff. But now that the house is finished and we have prototypes on both sides, I can really concentrate on the low-income aspect, which of course is the heart of all this."





Top: The railing atop the center section of Swan's house, which contains the library and reception room, rims the flat roof, which also serves as a panoramic deck. ***Middle:*** *Hoisting lime-and-sand plaster to finish the roof, which must withstand hard winter rains.* ***Bottom:*** *Mud, muscle and the simplest of tools are the elements of low-cost adobe construction.* ***Opposite:*** *Builder Mauro Rodriguez wheels mortar between Swan's house and the guest room. Though the Texas-Chihuahua desert is more verdant than that of Upper Egypt, the two river valleys have much in common climatically, and both are surrounded by dry mountains.*

Swan may be working alone, but she has built up a reliable corps of local supporters, partly because, when she arrived, local interest in adobe was already rising.

"It's booming," says former Presidio High School principal Teddy Purcell, who lent office space to Swan before her house was habitable. He hoped to add an adobe masonry curriculum to his school's vocational offerings. "She's a great resource and nobody else does those vaults," he says of Swan.

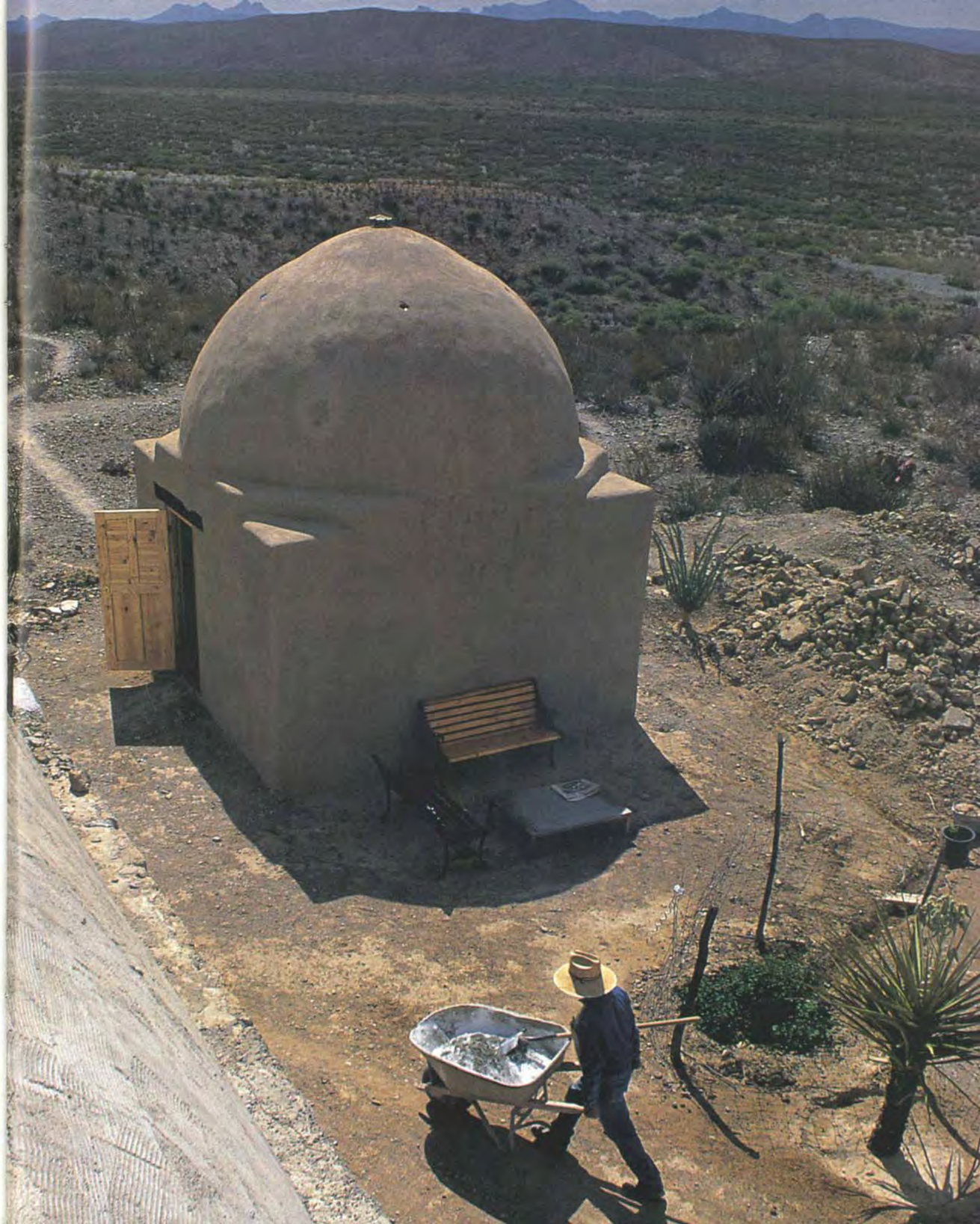
"We just have to unite the poor and marginal people—that's me, too, you know—show them the houses, and then maybe we could make some kind of cooperative," muses Karl Downing, who owns one of the town's few tourism-oriented businesses. "I'd love to see lots of adobe here. It would be great for tourism and it would be pretty."

City Manager Michael Kovaks points out that in the construction industry, Swan faces "a skepticism that she's helping move toward acceptance. Some of the brick-and-wood building guys, of course they're skeptical, but then you get them out to see her place and they're sold. But anything new [in low-income housing] takes forever because it's public money and the taxpayers want something that will last. And I know by now that whenever someone says something like that when Simone's around, she'll pull out some picture of [an adobe] building in Egypt and say 'Look! This one lasted 3000 years!' So I think it will work in the long run, but it will take time to be accepted."

Meanwhile, Jimenez and her crew are up on Swan's roof applying the first of two coats of lime-and-sand plaster that will protect the adobe from rain. Although progress is slow, Swan takes some comfort in recalling the official resistance Fathy faced so consistently for a half century.

"If he could be here right now," she says, "I'd ask him first, 'Hassan Bey, do you find this architecture that I have built to be truly harmonious with the culture, with the environment and the climate?' Now, is it?" she asks, pausing to look about with a self-critical eye. "I hope he would agree. I really hope he would."

But as for community-building and her role as a "barefoot architect," Swan says, "I know what he would say about that! He would say, 'Simone, you've already created a community link with your mason, plasterer and helper, with Daniel [Camacho] and many others. It takes time for the rest to come. To be authentic, to have real change, it takes a lot of time.'"

And over on the other side of the river, as he beats earth, water and straw each morning with his feet, Daniel Camacho is learning the same lesson. ⊕

Dick Doughty once spent much of a year carrying bricks and mixing mortar for a West Virginia chimney mason. He is now assistant editor of Aramco World.