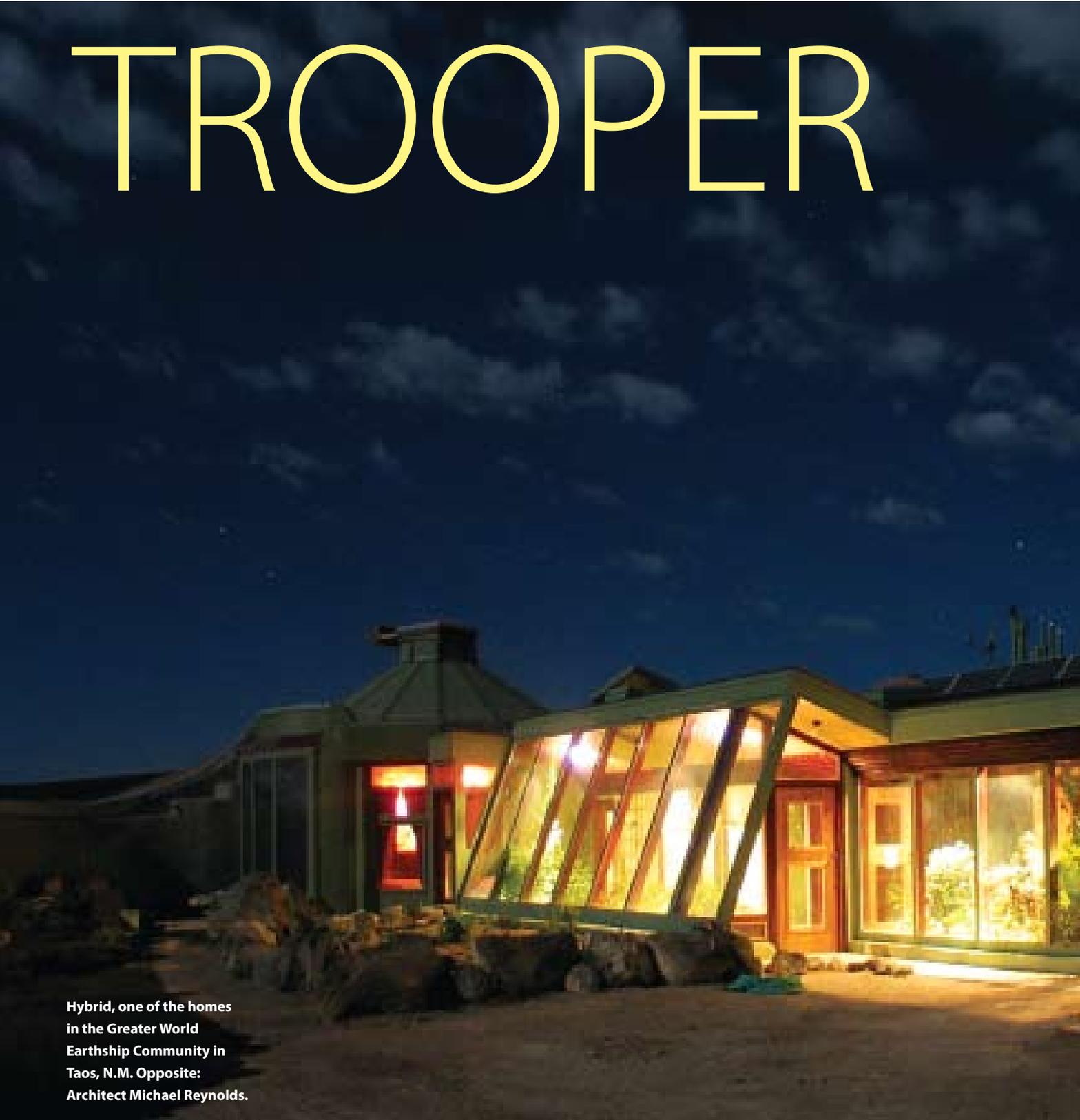


EARTHSHIP

TROOPER



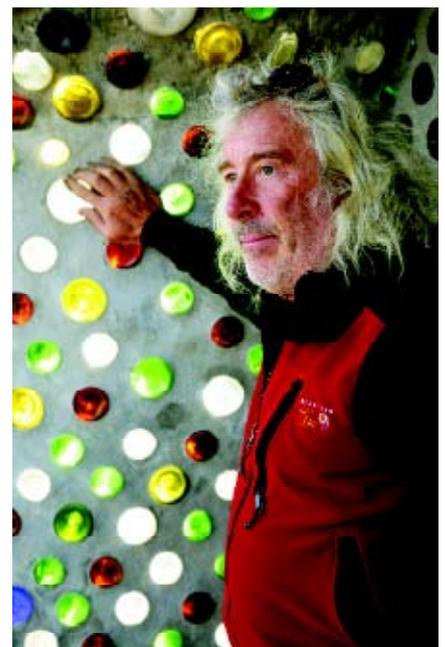
Hybrid, one of the homes
in the Greater World
Earthship Community in
Taos, N.M. Opposite:
Architect Michael Reynolds.

New Mexico's Michael Reynolds has been building his variety of low-consumption, off-the-grid housing for decades. Now, though, the Earthship is taking off.

BY MICHAEL HAEDERLE



The speed limit posted on the rutted dirt road that winds through the Greater World subdivision is 20 mph, but Michael Reynolds is easily doing twice that as he rides his knobby-tired Yamaha TT500 bike to the job site, his white mane flowing in the slipstream. He pulls up next to a strange-looking structure with curving walls and a row of big, south-facing windows and leads me in the door. The rooms are set side by side, with glass-covered front walls opening onto a corridor running the length of the building. The result is a double greenhouse that captures sunlight pouring in through the windows. Although the June sun is already glaring over the vast mesa outside Taos, N.M., the smooth, mud-plastered walls inside the half-finished building are cool to the touch. "It makes the space that you hang out in 65 to 75 degrees year-round, with no fuel," Reynolds says. That's how it's supposed to be in an Earthship, the self-sustaining dwelling Reynolds has been refining over the past 35 years.



REYNOLDS HAS LONG PREACHED THAT WE NEED TO GO “OFF THE GRID,” ELIMINATING OUR RELIANCE ON THE FRAGILE WEB OF UTILITY AND SEWAGE SYSTEMS THAT KNITS TOGETHER MODERN CIVILIZATION. NOW, AS GLOBAL CLIMATE CHANGE AND ENERGY SCARCITY LOOM, PEOPLE ARE STARTING TO PAY ATTENTION.



“This is our latest model,” Reynolds says. “It’ll probably work better than anything we’ve done.” Earthships have earned the 63-year-old renegade architect some attention over the years, much of it from cable television shows marveling at their novel construction. Reynolds builds exterior and interior walls from discarded tires, “steel-belted, rubber-encased bricks” packed tightly with soil. This creates mass that absorbs heat from the sun in the winter but keeps a cool, steady temperature in the summer. Multi-hued glass bottles used as building blocks in bathroom walls admit a jewellike pattern of light, while a honeycomb of aluminum cans and plastic bottles bulks up exterior walls that are later covered with stucco.

Earthships use photovoltaic cells that produce enough electricity to run lights, computers and flat-screen TVs; their roofs funnel rainwater into underground cisterns. “Gray water” from sinks and showers first irrigates

The \$1.5 million Earthship known as The Phoenix and its living room (right).

vegetables, flowers and small trees in the greenhouse and then flushes toilets. Northern New Mexico’s high desert receives about 12 inches of precipitation a year, with temperatures that can top 100 degrees in the summer and plunge to 35 degrees below zero in the winter, yet Earthships are surprisingly comfortable, year-round.

Reynolds has long preached that we need to go “off the grid,” eliminating our reliance on the fragile web of utility and sewage systems that knits together modern civilization. Now, as global climate change and energy scarcity loom, people are starting to pay attention.

Garbage Warrior, a new documentary from British filmmaker Oliver Hodge that follows Reynolds on his quest to transform the way we live, is being shown at film festivals and in theaters around the world. Thanks to



the publicity and Reynolds’ self-published books, people have been calling Earthship Biotecture, Reynolds’ design-build firm, to book \$200-an-hour phone consults about building their own Earthships. “We’re swamped,” he says. He has built demonstration models in rural Bolivia and the tsunami-ravaged Andaman Islands, as well as in Holland, France and the United Kingdom. Reynolds will spend the summer launching an Earthship resort on the Caribbean island of Bonaire; in the fall, he’ll teach at an architecture school in Bergen, Norway.

“We’ve been doing this for 35



years,” Reynolds says. “All of a sudden, the world has realized they need it. The good thing is we’ve had 35 years to rehearse. To be honest, we’re pretty fucking good at it.”

If he sounds cocky, Reynolds has needed self-confidence to hew to his singular vision. In the past 10 years, he has been sued by disgruntled homeowners, accused by local government of building illegal subdivisions and forced by the state of New Mexico to relinquish his architect’s license. (He remains licensed in Colorado and Arizona.) He even

donned a jacket and tie to wage a three-year fight to get the New Mexico Legislature to pass a law allowing people to test off-the-grid housing.

But in a sign of changing times, he’s won county approval for Greater World, the most populated of the three Earthship subdivisions he’s built around Taos and has even been appointed to the Taos County Planning Commission. Those subdivisions include roughly 100 homes that cater to an eclectic mix of hippies, teachers, artists, architects, hospital workers and retirees.

Greater World, which sits on a 650-acre tract a mile west of the scenic Rio

Grande Gorge Bridge, has become a popular attraction for tourists, who stop by to see the nearly 60 Earthships dotting the landscape. That may explain why the state recently earmarked \$300,000 to build a new visitor center there.

Reynolds grew up in Louisville, Ky., and after graduating from the University of Cincinnati’s architecture school in 1969, he moved to Taos, then an end-of-the-road haven for artists and hippies. Troubled by the accumulating debris of consumer culture — tires, bottles and cans, plastics — Reynolds decided to in-



corporate it into his construction. He bought 20 acres of cheap land in the early 1970s and started building experimental structures, including a meditation pyramid made of beer cans and a geodesic dome; he lived in them himself to see how well they worked. Like other builders in the Southwest who weathered the energy crisis of the Ford-Carter years, he copied the ancient Anasazi Indians and started orienting his houses south-by-southeast to capture solar energy.

The idea of using earth-filled tires

to store energy and maintain a steady temperature came later. Reynolds built his first Earthship in 1987 (at a dirt-cheap \$17 per square foot). He still lives in it with his astrologer wife, Chris. A growing number of ecologically minded followers were inspired by his vision, and Reynolds soon wrote *Earthship Vol. 1*, the first in a series of how-to books to enable people to build their own homes.

The Earthship concept gained an early ally in the late actor Dennis Weaver (of *Gunsmoke* fame), who

had Reynolds build a 10,000-square-foot home outside Ridgeway, Colo., and talked up Earthships on *The Tonight Show*. Reynolds meanwhile started several Earthship subdivisions around Taos. STAR (Social Transformation Alternative Republic) was set on 1,100 acres just west of Tres Orejas, an extinct volcano. He carved out building sites on a steep mountain slope near the mouth of Taos Canyon that he christened REACH (Rural Earthship Alternative Community Habitat), and



The Phoenix greenhouse and the view from one of its windows.

Weaver commissioned him to build a second Earthship there.

Pat Habicht remembers the heady days in the early 1990s when it seemed Reynolds could do no wrong. She lived for 10 years in one of the first Earthships, perched on Blueberry Hill west of the Taos Plaza; she later sold it to move into a retirement community. “The great thing about Mike is that he was the first person here to make people seriously think about what the options are,” she says. “He’s concerned with the whole world and not just a

few houses that one person can build.” Habicht adds that Earthship living was a memorable experience. “I miss that feeling of being looked after by the Earth. They really do work.”

But even as his concept was catching on, Reynolds was heading for a fall. In building his Earthship subdivisions, he says he relied on informal agreements with county zoning officials and the state Construction Industries Division, neither of which objected to what he was doing because they understood that Earthships

were still experimental. But then a new Taos County planner took office and in 1997 declared Reynolds’ subdivisions illegal — after all, they had no utility infrastructure. Several people for whom Reynolds had built homes sued or filed complaints with the state, alleging that their Earthships leaked or were too cold. There were also allegations of cost overruns.

It was the prelude to years of conflict. Where Reynolds had once been hailed as a visionary, now “I was a crook,” he says. Responding to various complaints, the New Mexico Board of Examiners for Architects filed formal charges against him in 2000, and later that year he agreed to relinquish his architect’s license.

Meanwhile, in 1998, Reynolds was sued by Earthship owner Suzanne Martin, who alleged he had violated the state’s Unfair Trade Practices Act and breached their contract. Martin’s attorney, Lorenzo Atencio, says the construction on Martin’s two homes was shoddy. “The roof leaked,” he says. “The water storage system was not working properly. The wiring was exposed and unsightly.” And, Atencio says, the solar composting toilets Reynolds was using in those days didn’t work properly. A judge ruled in Martin’s favor in 2003. Reynolds appealed the decision, but the case was settled when Reynolds agreed to buy the Earthships back from Martin, Atencio says. Court records show all claims were dismissed in 2004.

Reynolds, who represented himself in court, is bitter about the whole thing. “They took my license,” he says. “I got sued and lost a half-million dollars.” The way he sees it, his legal problems resulted from the trial-and-error nature of his ongoing experimentation. Reynolds is always tinkering, trying new ideas and discarding the ones that don’t work. At the same time, he has an obvious disdain for rules and regulations, which, in his view, hinder him



from refining his designs in time to avert global catastrophe. Might some see that approach as reckless? “Hell yes, I’m reckless,” he declares. “How are you going to get through a jungle without swinging a machete?”

Sobered by the experience but unbowed, Reynolds says the ordeal taught him how little he needed to get by. “That stretch of hard times lightened my pack,” he says, “and I’ll never fill it up again.”

Although Reynolds is well known among alternative housing enthusiasts, he is far from a household name within the U.S. architectural establishment. “I think he’s making a big impact on a global level,” says his friend Marilyn Crenshaw, a Santa Cruz, Calif.-based residential and commercial architect. “I don’t think he’s making a big impact in the U.S. I wish he would because what he has to share is great.” His genius resides in his ability to integrate

thermal mass, solar power, rainwater catchment, photovoltaic and other technologies into a working whole. “Michael is an amazing systems designer,” she says.

But Reynolds doesn’t dress or act the part of the serious architect and so isn’t always taken seriously, Crenshaw says. “He’s an innovator — people resist change,” she says. Crenshaw predicts that in an era of global warming and skyrocketing energy prices, “They’re all going to call him a rebel until the day they’re begging for it.”

Reynolds has lectured at various U.S. architecture schools through the years, and architecture students from Reynolds’ alma mater, the University of Cincinnati, have come to Taos to study with him. His work has also been written about in a number of textbooks and earlier this year was included in a Canadian Centre for Architecture exhibit on designs responding to the energy shortages of the 1970s. He has

been invited to participate in a design project at the Bergen School of Architecture in Norway this fall.

From a distance, the Earthships at GreaterWorld look like they’re afloat in a sea of sagebrush. Their windows glint in the sun, their roofs sloping back to humps that blend into the terrain. Reynolds shows the energy of a man 20 years younger as he walks briskly from room to room at the newest Earthship, nicknamed the Corner Cottage, inspecting the progress that has been made. Bearded, with wary green eyes, he delivers a rapid-fire monologue peppered with apocalyptic analogies. (In a scene from *Garbage Warrior*, he likens modern society to a herd of buffalo about to plunge off a 1,000-foot cliff.) He sometimes stays up at night worrying about how easily the systems that support our civilization could be disrupted by natural disasters



Detail from a wing
of The Phoenix and one
of its bedrooms.

or man-made catastrophes. Events like Hurricane Katrina and the 2004 Indian Ocean tsunami underscore his concerns. “I don’t trust that the power and water and sewage is going to be available in the future,” he says.

At the Corner Cottage, half a dozen workmen with ponytails and dreadlocks pause at their work as Reynolds discusses with them what they would tackle next. The loss of his New Mexico architect’s license hasn’t hindered him much: There is no requirement that an architect be used to design residential housing as long as the plans are reviewed and stamped by an engineer or architect. He retains his general contractor’s license, and several members of his crew have architecture degrees.

Not that they need much direction. They have built most of the homes at Greater World (a total of 130 are planned), and many live here. They have mastered the art of pounding soil into tires with hand sledges and building

walls from bottles and gobs of cement. They know how to craft ceilings with 12-inch *vigas* — peeled pine trunks harvested from nearby mountains — and how to trowel a smooth mud plaster flecked with bits of straw. Most of them are young enough to be his sons, but Reynolds regards them as his friends.

Just down the road, the sprawling 6,000-square-foot showpiece home he’s dubbed The Phoenix features a two-story greenhouse big enough to house a small fishpond, a gazebo and some citrus trees. Reynolds rents this place to overnight guests, who come from as far away as Japan to experience Earthship living for themselves. The Phoenix has been advertised for sale on the Internet for \$1.5 million, which Reynolds admits is pricey, but he says this project is intentionally over the top, calculated to get wealthy and influential people interested. Meanwhile, he and his crew are building the prototype for an affordable three-bedroom, two-

bath house that would suit the finances of ordinary homebuyers.

The Phoenix needs landscaping at the moment. There’s an unfinished bottle-and-cement wall meant to serve as an enclosure for goats and sheep, and piles of construction debris dot the periphery of the building site, parched in the desert sun. Inside, though, it’s a semitropical arboretum. The air is fragrant with the scent of growing things — bananas, grapes, corn, lemons, tangerines, oranges, tomatoes, amaranth, coconut palm and eggplant. All told, about 2,200 square feet of the structure are devoted to food production. “A family of four could live here, period, with nothing from the outside world,” Reynolds says as we stand in the greenhouse.

In the kitchen, a super-insulated refrigerator runs on current from the photovoltaic system. The compressor is located on the top of the unit instead of the bottom so rising heat won’t work against the cooling system.

The stove runs on bottled propane — Reynolds' one concession to outside energy sources. He estimates that a standard 500-gallon propane tank will last for about three years, totaling \$50 a year in energy costs.

Behind the living space is a long, narrow corridor, one wall of which is the towering stack of tires that give the building its thermal mass (there's another three feet of compacted earth behind the tires, a barrier of rigid insulation and then several feet of mounded soil moved in with a backhoe). Transom openings in the rear of the rooms vent into this hallway, which has two vertical shafts leading up to large, movable skylights. With the tug of a rope, the counterweight-loaded covers can be raised, allowing warm air to escape.

Outside, I follow Reynolds as he climbs onto the slope leading up to the building's roof. Reynolds shows a V-shaped membrane that collects rainwater running off green sheet metal and directs it into twin drains leading to buried 3,000-gallon cisterns. He opens a cabinet housing the deep-cycle batteries that store power from the photovoltaic cells and another containing storage for biodiesel containers. "What we're doing now is putting a small biodiesel plant, about the size of a washer, in each home," he says. With five-gallon cans of cooking grease obtained from local restaurants, occupants can produce 25 gallons of biodiesel a week and use it to supplement the rooftop solar collector that heats hot water for the kitchen and bath.

Reynolds calls my attention to a multicolored decoration along the roofline made from enameled sheet metal. The panels were harvested from washers, dryers and dishwashers at the local dump, he says. His workers have even salvaged heavy-duty trampoline springs to operate the skylights. "The dump is a gold mine; it really is," he says. "We're using products that our neighborhood produces, and they don't require any fuel."

A large Earthship like this one might use 1,000 tires, Reynolds says,

A look at Hybrid, from the rear. Rainbow not always included.

each of which takes seven gallons of oil to produce. A growing number of the roughly 290 million scrap tires generated in the U.S. each year are burned for fuel or ground up for road base and other uses, but about 27 million still wind up in dumps. "I've got a mountain of tires," Reynolds says. "There are more tires than there are trees." He acknowledges that an Earthship still requires new building materials, including lumber, glass, insulation, wire, cement and steel. But by comparison with conventional construction, he estimates, "I'd say we've reduced the materials to the tune of 50 percent."

The Earthships at Greater World run the gamut from lovingly tended to rough and half finished. That partly reflects the limited finances of some of the DIY owners but also something of the founder's outlook. Pat Habicht, who did the finish work on her Earthship, says that for Reynolds, who favors function over form, aesthetics are strictly of secondary interest. "He doesn't care what the hell it looks like," she says, laughing.

Reynolds believes it's unconscionable for an architect to focus on how a building looks with little or no regard to what effect it will have on the environment. "They're still allowing architects to make these little monuments to themselves that cost \$60 million," he snorts. "That's a big part of the reason I've called this Bioteecture. I don't think architecture is capable of coming around fast enough. I don't want to be labeled that."

Kirsten Jacobsen, Earthship Bioteecture's educational director, was a college student in San Francisco when she came out to Taos 14 years ago to do a research project on Reynolds. "I thought it was great that people living in houses like these were making an impact just by getting up and reading a book," she says. She



wound up becoming part of his tribe, spending the next four years on a construction crew. She moved on to help run the Greater World visitor center, and now she serves as Reynolds' right hand and air-traffic controller, keeping track of his commitments from the Earthship Bioteecture office, a ramshackle structure with a dome on top.

Jacobsen tells me it took her eight years to build her own 1,300-square-foot home in Greater World. While people simply live *in* a conventional house, she says, Earthship owners have to live *with* their houses. Jacobsen says maintaining the heating, cooling and water systems in her two-bedroom home doesn't require much time; it's

“ONE OF THE HAPPIEST DAYS OF MY LIFE WAS WHEN I WENT TO THE GAS UTILITY AND THE ELECTRICAL UTILITY AND SAID, ‘I WANT MY ACCOUNTS DISCONNECTED.’”



mostly a matter of raising and lowering the shades and opening and closing the skylights. She estimates that she spends an hour every few months cleaning out water filters. “In the U.S., these ideas exist on the fringe of ‘green buildings,’” she says. “We’re not saying this is for everyone. We’re just saying this is a direction you ought to investigate.”

Tony Marvin, a longtime Taos resident who has renovated old adobe houses in town, bought a two-bedroom, 1,700-square-foot Earthship in Greater World two and a half years ago with his girlfriend. “It’s absolutely a stunning home,” he says. “There was actually nothing this beautiful at this price in Taos — not even close.” There

was “a learning curve” in mastering the building’s water and electrical systems, Marvin says, but they work well. “One of the happiest days of my life was when I went to the gas utility and the electrical utility and said, ‘I want my accounts disconnected,’” he says.

Serenity and self-sufficiency may be his goal, but Reynolds these days seems to be in perpetual motion, juggling international phone calls and supervising construction projects while finding time to draft floor plans and add to his collection of writings. His cluttered office at Greater World is strewn with blueprints and site renderings, the walls covered with large calendars mapping out his travel for the next six months.

He acknowledges the house-afire urgency, recounting a recent phone consult with a couple so worried about climate change that they told him, “We just need to get in a house that’s going to take care of us — now.” Reynolds warns there isn’t much time.

“I knew that things were going down the tubes, and it was going to take a long time for people to get desperate enough to make these changes,” he says. “We extended ourselves out there for a long time, and nobody cared. Now that they see the icebergs melting, everybody cares.” [M2](#)

Michael Haederle is an Albuquerque, N.M.-based writer.