

# OAK RIDGE

JULY 2018

## Neighbors



*Keith Kline and Virginia Dale on Their Wedding Day*

THE HOUSE THAT

*Photo by Debi Campbell*

# ~~JACK~~ SCIENCE

## BUILT

# OAK RIDGE Neighbors

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## CONTENT SUBMISSION DEADLINES

Content Due	Edition Date
December 5	January
January 5	February
February 5	March
March 5	April
April 5	May
May 5	June
June 5	July
July 5	August
August 5	September
September 5	October
October 5	November
November 5	December

# Dear Fellow OAK RIDGERS

Welcome to July, a time of year when temperatures can reach close to 100 degrees and humidity lingers not far behind. The aroma from backyard grills wafts through the neighborhood on quiet Friday evenings. And our power bills shoot up like the recent spike in gas prices.

June's cover story on "volunteer extraordinaire" Connie Hunley generated lots of feedback from readers, thanks in large measure to Carolyn Evans' writing and Debi Campbell's eye for just the right image. We're lucky to have them as part of the *Oak Ridge Neighbors* team. They pair up again this issue for our cover feature we call "The House That Jack Science Built."

We welcome some new neighborhoods this month. Residents of Southwood and Wiltshire Drive now receive *Oak Ridge Neighbors*. We'll be adding to our distribution from time to time.

This issue is chockful of good information from our Expert Contributors. These articles are written by local business owners who want to share their expertise with you. We're pretty picky about our experts and they've earned the opportunity to offer you their sage advice. We'll be adding new expert categories in the months ahead, and we're always looking for honest, capable contributors. Know someone? Pass it along. Our email address is at the end of this letter.

This month's Nonprofit Spotlight covers the work of the Free Medical Clinic of Oak Ridge, an organization devoted to providing basic healthcare to people without health insurance. And we offer a few interesting photos in our new Scene Around Town section. We'd love to have you participate by sharing your own pictures of life in Oak Ridge. Same email address.

Finally, a word of thanks to the local sponsors that allow us to bring you *Oak Ridge Neighbors* every month. We're it not for their support — we'd have no magazine. We'd appreciate it if you'd give them a chance to serve you. They're good people and skilled in their respective areas. We support local businesses and hope you will, too.

Again, thanks for cheering us on. And remember to tell your friends you read it in *Oak Ridge Neighbors!*



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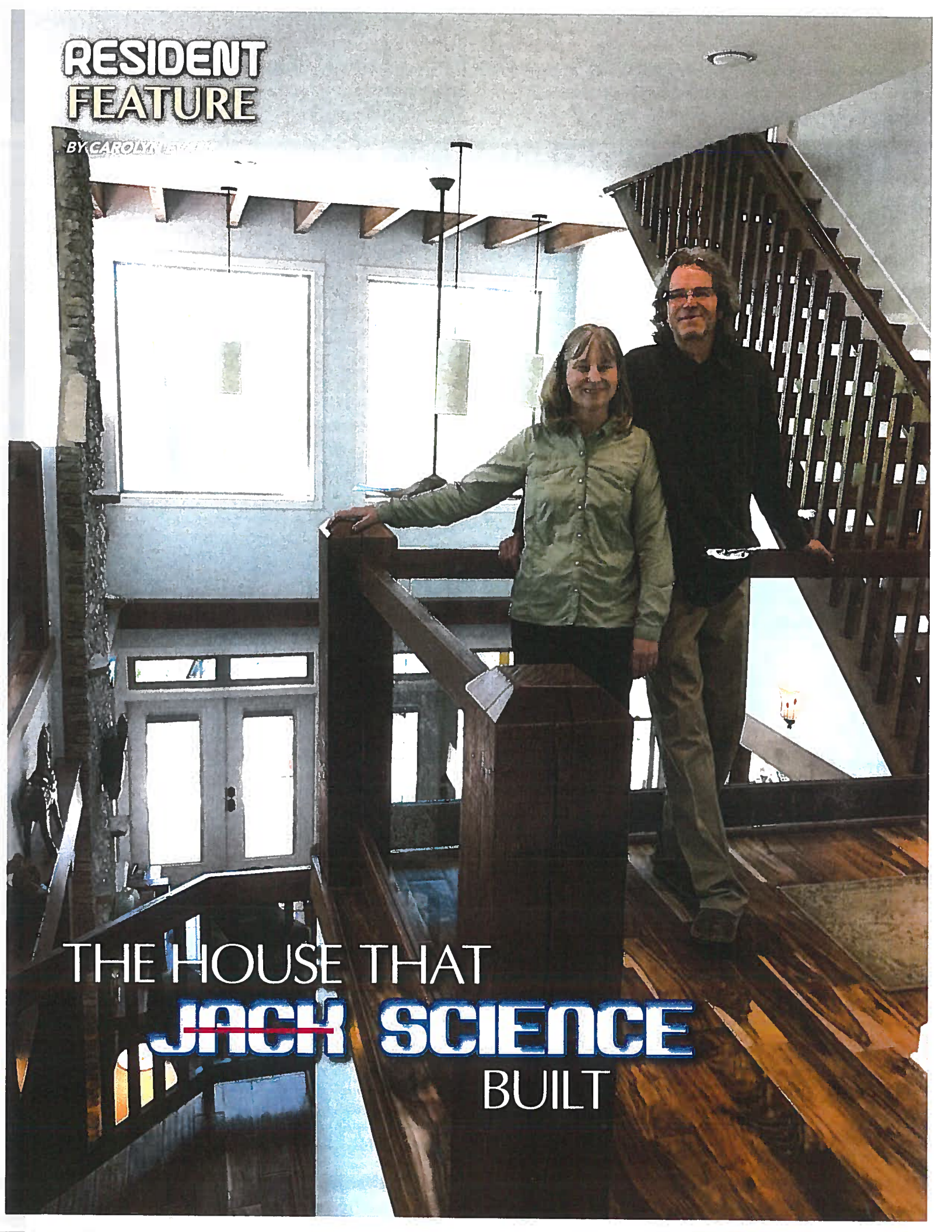


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# RESIDENT FEATURE

BY CAROLYN LEVINE

THE HOUSE THAT  
**JACK SCIENCE**  
BUILT



# Oak Ridge scientists build innovative energy-efficient house

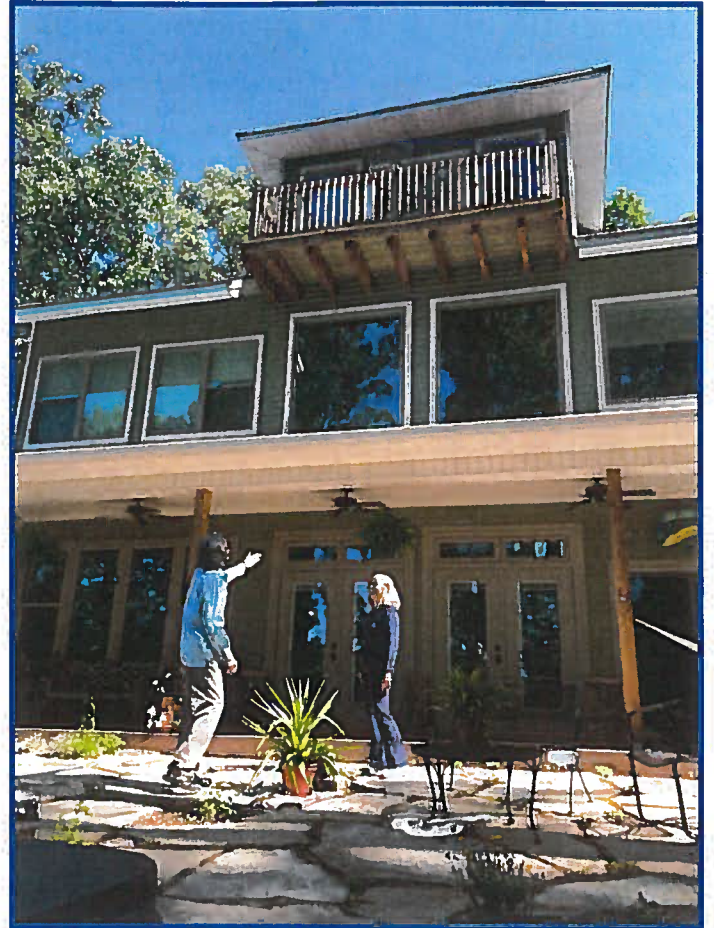
**G**etting married and building a house are pretty normal things to do. Marriage counselors, however, will tell you that building a house together can test the strength of your union and might just send you to their office.

But when you're both world-famous environmental scientists, building a house together becomes something different and more complex. Every detail is important: the slope of the lot, the orientation of the house to the sun, locations of doors and windows, the materials. It could become the greatest lab experiment and research project of your career.

For Virginia Dale and Keith Kline, it has been five-year process worked in between full-time jobs and speaking engagements around the world. Now their joint home design-and-build adventure is almost complete. Several unfinished projects, such as the raised bed garden and figuring out how to build a path down the steep hill to Melton Hill Lake, will have to be taken care of later, between intensive work schedules and invitations to New York, Mexico, and China to share research results.

## **TREES, TREES, TREES**

Virginia and Keith were excited to find land for sale with several desired qualities, including a building site with a south-facing slope offering expansive views. They began to plan. *Continued on page 10.*



To start with, they wanted to respect and enhance the natural qualities of the site, which they named Hickory Creek Sanctuary. So before anything else, they hired Joshua Granger, a forestry consultant, who identified invasive trees and shrubs, such as Autumn Olive that should be removed, as well as beneficial trees and unusual specimens to be conserved.

"We were delighted to find that we have a large diversity of mature trees including a majestic chinkapin oak, a gigantic American beech, eastern hophornbeam, and a large winged elm," Keith said. "The lot is in an oak-hickory woodland including cherry, sourwood, and on the rocky hillside, has large native sparkleberries, a small tree highly valued by wildlife. Specimen trees on the lot were tagged and barriers erected to reduce potential damage from upcoming excavation and construction work."

## ANGLES

At the same time, plans for the house began to take shape and Keith made several trips to the lot around equinoxes and set tall vertical stakes in the ground to mark out the wall alignment, because compasses can be off by several degrees.

"The house sits at a funny angle compared to the neighbors," he said. "The walls are oriented so that most windows face 'true solar south,' and the north side of the main floor is buried in the hillside to help keep the house cool in summer."

From mid-October through March, sun penetrates the southern windows for natural heating. Fixed overhangs allow only indirect light, the rest of the year. But around the winter solstice in late December, the light streams through large high windows reaching the far wall on the north side of the house.

## WORKING WITH MOTHER NATURE

"We incorporated many design elements to reduce energy costs but also wanted to minimize environmental impacts and economic costs," Keith noted.

Virginia explained that one such goal was to maximize use of natural light. "During daylight, every room gets sunlight, with the bathroom and closet using light tubes from the roof and other spaces using transparent transoms above interior doorways. And we wanted to use local and reclaimed materials as much as possible."

Some materials came from Habitat for Humanity of Oak Ridge. Others were repurposed from the Oak Ridge Unitarian Universalist Church (ORUUC) when it was torn down for the new Kroger. Required new materials were supplied by the Clinton Home Center, where Tommy, the owner, helped with structural design issues for the custom home built by Irwin Construction, a local family business.

## LOCAL EXPERTS LEAD A HAND

"We spent some effort to find local people who were willing to work with us to achieve cost-effective, energy efficient, and environmentally sound design goals," Keith said. "That was a much bigger challenge than we anticipated. We went through a lot of candidates. Our first selected builder abandoned the project just after we started. Luckily, our architect, Christopher King of Appalachian Design, was flexible and creative. And we identified Kenny Powell, with Powell Brothers Mechanical Contractors in Clinton, at the outset of the design process to install our heating and cooling, insulation, and weatherization. Kenny was a superb collaborator."

As they planned the house, Powell went through several modeling exercises with the couple who initially hoped to have a super-tight passive home without conven-

tional duct work. "The problem with our initial plans was not heating and cooling, but rather effectively controlling humidity throughout the house," Keith said. After considering many options, they agreed with Powell's proposal that the new Trilogy package from ClimateMaster, linked to a geothermal loop, was the best option.

"It's about the most energy-efficient system, and it provides air heating and cooling, humidity control, and hot water, all integrated in a single unit," Powell said. "The 30 percent tax incentive for any geothermal unit makes this a good investment. Although this incentive was suspended for one year, it is now back."

Powell went through special training to learn how to install the unit and is the only licensed distributor in the region. He has installed about 30 units in the region to date and expects to do more.

"I'm about the only guy in East Tennessee installing the Trilogy," he said.

Bruce Glanville, provided advice and testing. "We have four sets of geothermal lines in the yard that extend about 400 feet each 6 feet underground," Virginia said. "You can also install deep well geothermal like the Oak Ridge High School did, but it's easier to do the shallow lines. We tried to run the lines under our future garden, where they will do least harm to these trees," she added pointing to large nearby red and black oak trees.

"The system takes advantage of the earth's constant underground temperature by using circulation lines, which help with cooling in summer and assist with warming in the winter. Any excess heat generated by the unit is dumped into the large hot water tank," Keith explained.

## THE TOUR

"Our original concept was that you would see only this small cottage-like structure and think, 'This is the house,'" Keith said, walking onto the north porch, "but most of our house, the main floor, is underground."

As he opened the front door, light flooded in from skylights and windows.

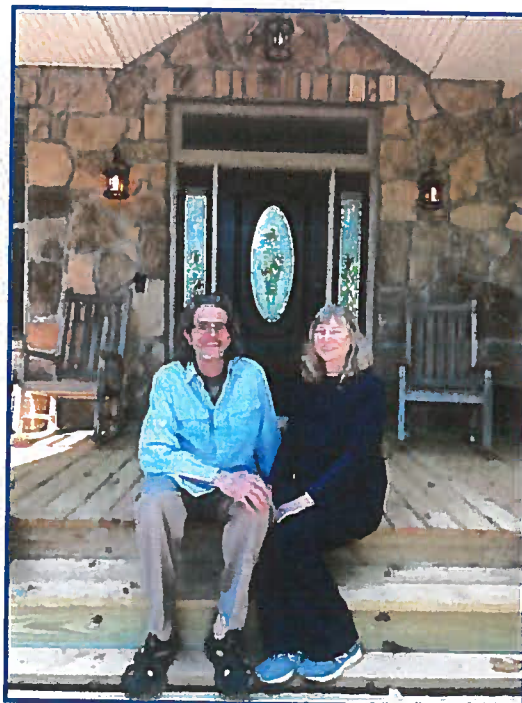
"The posts around the great room, as well as the wood in ceilings and the barn doors, are from cherry and oak trees we harvested from where the house now sits," Virginia said. "The hand railings and balusters, inside and out, are made from reclaimed wood from the Unitarian church."

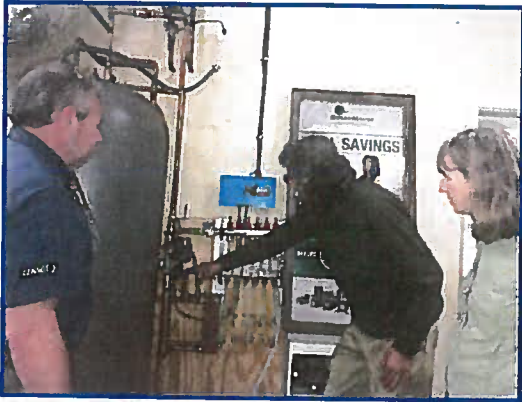
## RESEARCH AND WRITING

Virginia recently transitioned from director of Oak Ridge National Lab's Center for BioEnergy Sustainability to the University of Tennessee where she continues her environmental research. In her work at the lab she focused on environmental decision making, plant succession, land-use change, landscape ecology, ecological modeling, sustainability, and bioenergy systems. She has authored 10 books and more than 250 published articles. She has also served on the scientific advisory boards of five federal agencies and several committees of the National Academies of Science.

Before Keith came to work at ORNL full-time, he worked for the U.S. government on energy and environmental conservation projects, living for 25 years in Central America, South America and Africa. Most of his projects were aimed at reducing deforestation, conserving tropical forests and biodiversity, and improving water management and farming systems. Like Virginia, he has published a multitude of papers.

Both Virginia and Keith had prior experience in designing and building homes. Keith studied solar energy utilization and design at the University of Michigan in





stairs is for the grandkids and visitors, complete with beds and toys that used to belong to our children," Virginia said, adding that her daughter who lives in Alexandria, Virginia, and two grandchildren were coming that weekend.

As they sit on the third floor balcony or in the main floor's screened-in porch, they can watch the bald eagle in the trees or the deer foraging nearby.

"We call this Hickory Creek Sanctuary because we want it to be a comfortable and welcoming refuge for everyone, including nature. We have regular visits from osprey, beaver, coyote, wild turkey and of course, lots of deer," Keith said.

Other special touches on the property include a cistern that Keith designed to collect rainwater to use in the garden and a large four-season screened porch that they use daily. The patio area on the same level as the main floor required a lot of extra site planning by Keith. "We didn't want the maintenance and restrictions created by a lot of decking, which would be more typical on this hillside," he said.

"The patio required a lot of work and drawings, and guidance to the builders to get the elevations and drainage correct," he added, pointing to the flagstone patio and flower garden outside the southern glass façade of the house.

### **GLAD THEY DID IT**

Building a house didn't send them to a counselor. Instead, it's become a science experiment that they're expecting will go a lifetime. They've learned a lot about building an energy-efficient home using reclaimed materials, but there's still more to do and learn. A new blogsite will be used to share lessons learned. And once they get boxes unpacked, watch for an announcement for an open house.

The two scientists did not agree on every detail during this five-year process, but agree on this: "We want others to be able to learn from our experiences and do even better."

the 1970's and has continued following solar and energy efficient technological developments, hoping to apply them some day.

"It took over 40 years to get to this opportunity, and we couldn't implement all our ideas, but this is a start," he said.

Limited experience in the local building community and added costs of doing something different from standard practice, prevented several design ideas from moving forward, such as a living green roof and PV panels, at least for now. The couple are monitoring the energy performance of the house and will continue to tweak the systems to minimize energy use over time.

### **PERFECT FOR THE GRANDKIDS**

They have four kids between them and eight grandchildren who visit regularly.

"The house is designed so that we can live comfortably on the main floor. The up-