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Basement Whodunit



by Elizabeth Grant
Photos by Elizabeth Grant

An architecture professor plays detective to figure out what alien—and possibly dangerous—substance lies beneath her basement flooring

Hello, *Home Energy* readers. You may remember my story from a previous issue (“Adventures in Radon and Moisture Mitigation,” *HE* July/Aug ’14, p. 20). I’m the architect-turned-academic who introduced deadly radon gas into my home through holes in the slab meant to keep groundwater from making its way onto the floor of my basement-turned-Scandinavian-loft. When an editor asked me if I would contribute another story—when most of my work is institutional, not residential—I thought I might not have anything any time soon. Boy, was I wrong.

Dehumidification Gone Wrong

After I fixed the radon problem in my basement, things were pretty good. We had been spending a lot of quality time in the downstairs family room, watching NASCAR and eating Cheetos. While the wall in the corner of the basement continued to be perennially coated with what I think is quite romantically called a “bloom” of mold, we hadn’t had any issues with water on the floor, and the sump pump we installed still hadn’t run, ever, though I had pulled the float upward a few times to check the motor. However, basements are basements, and ours tends to get musty, so I put two dehumidifiers in. The first is in the laundry room, with a piece of plastic tubing running from its interior into the washtub above which it is precariously propped. This works well, but as the basement is about 1,100 square feet, it isn’t sufficient to deal with the entire space, especially the part of the family room we usually occupy. So I put a second dehumidifier in the “problem” closet adjacent to the family room and told myself that I would empty the collection bucket faithfully. Which I did, for a while, until I forgot.

One night while we were watching TV, my husband said, “Gee, it sounds like that dehumidifier has been running for an awfully

long time.” Usually it would shut itself off after a day, maybe two if we were lucky, which indicated to us that it was time to empty the bucket. This involved bending over, removing the bucket, and staggering carefully to the laundry tub to empty out the water. It was a bit of a feat, as the bucket was always full to the brim. I should mention at this point that my husband had herniated the L5-S1 disc in his back and had undergone surgery to repair it, so this task usually fell to me. I should also mention that I am a delicate, dreamy sort of person who is not much inclined toward pedestrian tasks like emptying dehumidifier buckets. I prefer to do things like burn Feng Shui candles to ward off bad water chi. So it had not yet registered on my radar that we were in for a problem.

I opened the closet door and realized that the float cutoff switch had stuck, maybe due to improper reseating of the bucket, and that there was a puddle of water on the surface of our Pergo floor. I went and got some towels, emptied the bucket, and ran a fan in the closet to help evaporate whatever residual water I couldn’t see. I moved the dehumidifier to a space adjacent to the sump pump in the storage room next door, connected some plastic tubing, and ran the tubing into the sump pump. As I mentioned in the previous story, there are many small holes between the storage room and the family room, and the drywall on the wall between runs only up to the level of the lay-in ceiling, so I figured any remaining humidity would migrate its way into the storage room eventually and be removed by the dehumidifier there.

Revenge of the Dehumidifier or Something Worse?

Problem solved, we thought. A few years (yes, years) later, we started noticing the Pergo buckling a little bit in a part of the family room not far from that closet. Right in front of the TV, to be

exact. Right where we wanted to be doing our Wii “Just Dance” routines. So we called up the big-box store to see if we could still get the same Pergo and replace this small section. They sent out a guy who was very quiet and went about his business with his tape measure, and who left it to the annoying sales guy back at the store to tell me the bad news. Because they don’t make the exact same kind of Pergo as I bought in 2005, and because Pergo is installed with a tongue-and-groove system, they would have had to take all of the boards out of the whole basement and replace them with the new stuff. Or I could have cut out the bad area and replaced it with the new, frustratingly incompatible Pergo, and put a big, ugly transition strip across the middle of my family room floor. I’m not sure whether or not this was a load of hooey, but in any event, it was going to be expensive, so we literally took the brush-it-under-the-rug approach and went to the same big-box store (really) and bought a largish area rug to put in front of the TV to cover up the warped Pergo. Done.

Last spring, I managed to herniate my own L5-S1 disc, and I spent much of last summer resting on the couch, watching soul-sucking shows on the Disney channel with my daughter, now ten, and trying to ignore the vaguely musty smell of the basement. I still attributed this to the foundation wall in our closet, with its aforementioned mold blooms. Finally, I got frustrated, and my husband rolled up the rug and took it into the storage room. It was dry, but the Pergo underneath had black mildew along the joints. So we figured the elephant in the room could no longer be ignored. We gave our Amazonian daughter, the only remaining member of the family who could bend over without pain, a hammer with which to pry up one of our hopelessly anachronistic Pergo boards and see how bad the damage was. So she did. And it was bad.

There wasn’t a lot of water, but enough had gotten under the Pergo, and eventually under the polyethylene sheet below, to create a nice layer of mud on top of the concrete slab. In this mud were thousands of tiny worms, both living and deceased. The smell of all this was quite impressive. It seems there was a low point in the slab in the region in question, because the damage was fairly well contained to a roughly 6-foot x 6-foot space. We removed all of these boards and the polyethylene sheet beneath. We mopped up the thin layer of water, mud, and worms, and also took the hammer to the small area of drywall below the TV where water had wicked upward. Then we bleached everything and put the trusty fan back out to dry the area.

The Plot Thickens

It took me a while, but I started to wonder: Why did worms so enjoy polyethylene film, the relatively innocuous looking backing of Pergo, and what had to be the cleanest water in the house, pulled as it was straight

out of the air? Then, after the fan had been running for a day or two, and the slab remained wet, I started to get suspicious. It would be bone dry in the morning, and when we returned from work, a small puddle had re-formed in the area in question.

Being the budding forensic scientist that I am, I decided that perhaps the water was coming from a source other than a perhaps two-years-prior dehumidifier mishap. So I broke out the neon gel food coloring—you know, the kind your kid insists you buy for some school project, and then you have lying around your house for the next several presidential administrations—and took it down to the basement. I was of course upset to think that after all the trouble we’d gotten ourselves into with dampproofing the basement, the water could be rolling in from the foundation wall. I figured that the only way to know would be to trace it by putting some food coloring along the foundation wall near the area. There were some suspicious cracks in the floor slab, and so I tested those as well. We had previously had a broken water main in our front yard, resulting in a very unsettling squishy gravel driveway experience, so I couldn’t rule out something like that having happened again.

The food coloring plan was no scientific protocol that I’d seen before. I made it up, à la *MythBusters*. I suspected that, on a dry slab, the gel food coloring would remain where I put it until water got it wet, and then it would spread in the direction of the water flow. So whichever coloring got wet first would indicate the source of the water that was rewetting the slab every day. Fortunately, the neon gel food coloring experiment worked pretty well. The green coloring circled in the upper left in the photograph on the top of p. 20 shows that water was coming from a crack near the interior wall, and the purple coloring circled in the lower left shows that water was also coming from a crack in the center of the area. The foundation wall on the right side of



Left, my daughter removing the first of the Pergo boards in the affected area. Gloves (and shoes) are for sissies! Upper right, gross worms on the back of Pergo. Lower right, worms, mud, and God knows what else between the polyethylene sheeting and the floor slab.



Food coloring experiment to determine the source of the leak.

the image (dye not shown) was also tested, with no movement of the dye there. It soon became obvious that the water was coming mainly from a crack running diagonally from the top center to bottom left—that is, from under the slab.

I was relieved that at least the perimeter drainage angle was still doing its job, as it seemed clear that the water was bubbling up from the cracks in the floor. But why? And what were we going to do to fix it?

The answer came a few days later. The basement floor had dried overnight, but in the morning, a small puddle of water reappeared. Finally, I put two and two together and realized I had just started the dishwasher a few minutes prior. I bellowed up the stairs for somebody to stop it. Sure enough, when we stopped the dishwasher, the puddle didn't grow any larger. But of course, that wasn't the full answer. We still had to narrow it down to what is called, in technical parlance, potable (nice) water or sewer (not-so-nice) water. I asked my husband to fill a pot in the kitchen sink. Nothing. Then I asked him to dump said pot of water down the kitchen sink drain. Eureka! It was the pipe full of not-so-nice water, a.k.a. the sewer line, running under the basement slab that had clearly rup-

tured under the exact place I liked to dance to “Gangnam Style.” My kitchen scraps had been a veritable Diet of Worms, if you will forgive the Lutheran humor, for who knows how long.

Fortunately for us, that sewer line was connected only to the kitchen, and was upstream of the bathrooms in the house. So we temporarily converted the upstairs bathroom into a dishwashing station, and the downstairs bathroom became *the* bathroom, and we called the plumber out to take a look at the situation.

There were three options suggested by our plumber, after some head scratching and gnashing of teeth. The first of these involved essentially tracing the broken pipe's path by cutting a new trench clear across the floor of the family room and dodging three columns to tie into the downstairs bathroom sewage line. This did not seem like a great plan for structural and Chihuahua-nervous-condition reasons, and would cost a fair bit. The second option was to run the upstairs kitchen line through the ceiling of the finished part of the basement over to the downstairs bathroom wall, drop it down, and tie it back into the existing sewage line there. To achieve sufficient drop, this would necessitate casing the new pipe in an oh-so-attractive soffit around the perimeter of the family room, which would need to make multiple right turns and end up at about 6 feet 8 inches above the floor before reaching the aforementioned bathroom wall. And that was if we were lucky. Our plumber, who tends toward the philosophical, thought this might be the perfect location to install a pull-up bar. I, who do not tend toward the athletic, demurred. The third option, and the one we picked, was to run the line through the storage room, then run it down inside the exterior wall of the house, out through a hole just below grade, and thence down our nicely sloped backyard to catch up with the rest of the sewage pipe out there. Though this involved cutting unsightly trenches in the yard, it also involved the least ugliness and destruction inside the house itself.

The resulting pipe in the ceiling of the storage room was rivaled in beauty only by the one already along the floor of the



Above, the new sewage pipe runs downward from the kitchen drain (at left), slopes under the ceiling of the storage room and into the exterior wall of the house, and then down and out through the foundation wall into the backyard to tie into the existing sewage line. Below, the other side of the room sports an attractive radon removal pipe near the floor. I figure the two pipes balance one another architecturally, creating a poetic resonance appreciated only by the truly aesthetically inclined. The panoramic photos are curved, not the walls.

storage room sucking out the radon (as discussed in last year's story) and allowed us to regain a functioning kitchen fairly quickly. And, if the astute among you are wondering, yes, there is a small chance that sewage might back up from potential downstream nastiness into the cracked pipe we left abandoned under the family room slab. But we got the philosophical plumber to unclog the drain in the laundry room (also discussed in last year's story), which should be the lowest point in the system. Any future nastiness should, in theory, show up there first.

After living for a time with tarps all over the floor, we were ready to tackle the replacement of the Pergo in the whole room. We paid our daughter the princely sum of \$200 to remove the rest of the Pergo and haul it up to the road for trash collection, which she did with all the gusto, but none of the swearing, of a hearty longshoreman.

The Palimpsest of Laziness

Once this was removed, there was what I have come to refer to as a palimpsest of laziness beneath. Palimpsest is a fancy term I learned in architecture school, generally in reference to surfaces that, when they begin to deteriorate, reveal a rich legacy of prior works from ages past. Our floor was pretty much like that, only the "laziness" part is added because in this case people covered over prior layers in quite ridiculous ways in an effort to git 'er done. There were regions with ghosted outlines of formerly removed floor tile with residual black mastic, which was troubling, and, more troubling still, a region of suspected asbestos-containing floor tile that the nice Pergo installers (remember them?) had ignored and covered over. There was even a cute little ramp up to

this area of remaining tile, made of some kind of leveling compound. When discovering all this I exclaimed, in the words of the late great Dorothy Parker, "What fresh hell can this be?"

Uh-oh, Asbestos

Having worked as an architect in a firm also specializing in environmental services such as abatement of lead, mold, and asbestos, I was almost certain that the black mastic contained asbestos, and I was also very suspicious of the remaining floor tile. I called my old firm and they sent out a gentleman with a bunch of baggies and a cell phone who wrote me a lengthy and comprehensive report a few days later saying, essentially, "Yup." Asbestos in these materials is, I'm told, not a huge deal, as it is not particularly friable. However, since I was dealing with a mess already, I was eager to get rid of the tile once and for all.

One Friday while I was teaching and my daughter was at school, my husband, unbeknownst to us, decided to take a "vacation" day and abate the asbestos himself. He went online and got some instructions from the website of the Minnesota Department of Health on asbestos floor tile removal. He went to the big-box store and came back armed with polyethylene film, a respirator, and associated accoutrements. He started into the abatement by relocating the always-curious Chihuahuas, isolating the work zone, spraying soapy water all over the area, and crawling on his stomach under the film to chip away at the tile.

About a third of the way in, he remembered that he has back problems. He backed out from under the plastic, defeated, and we called in the abatement contractors, who made short work of the rest of it a week or so later.



Left, the elder investigative Chihuahua looks on with rapt attention as my daughter removes the rest of the Pergo. Upper right, a tiny leveling-compound ramp used to feather the edge of asbestos-containing floor tile. Lower right, collecting tile and mastic samples for the lab.



Reflooring and Rejection

Since my beautiful Pergo-floored Scandinavian loft had been destroyed by a litany of plagues involving raw sewage, worms, and asbestos, I began to daydream about other suitably urbane floor surfaces for my oh-so-cosmopolitan basement. Most of all, I was eager to encapsulate the remaining asbestos-containing black mastic by putting some non-worm-containing floor finish on top. The concrete contractors I called in to look at the possibility of grinding and polishing the surface seemed unconcerned with the mastic, but were too cowardly to call me back and tell me they weren't that into me or my tiny floor project. I had to call them to get that variety of "it's not you, it's me" rejection. Then my husband found some troweled flooring contractors at his work, installing new flooring in the exam rooms at the veterinary teaching hospital. Since my two investigative Chihuahuas have what you might delicately call bladder issues, it seemed appropriate to turn the basement into one big veterinary ward. And it was still ersatz industrial, which is what I was going for. But the troweled flooring guys, after stringing my husband along for a few weeks, never came out to the house. I think the job was too small for them as well.

The saga ended, quite predictably, with us putting some vinyl down over the entire asbestos-containing-mastic-ridden area, which extended even into the highly attractive storage room mentioned earlier. I know I said in the previous article that if the opportunity ever presented itself, I would fix my floor properly, but I didn't. It had already cost us thousands of dollars beyond the very fair insurance settlement to complete this work, so tile or wood was out of the question. As for carpet, please refer to my earlier statement about the Chihuahuas. I realize this flooring

choice will no doubt be fodder for my next article, when the vinyl starts to delaminate because it is a wonderful vapor barrier.

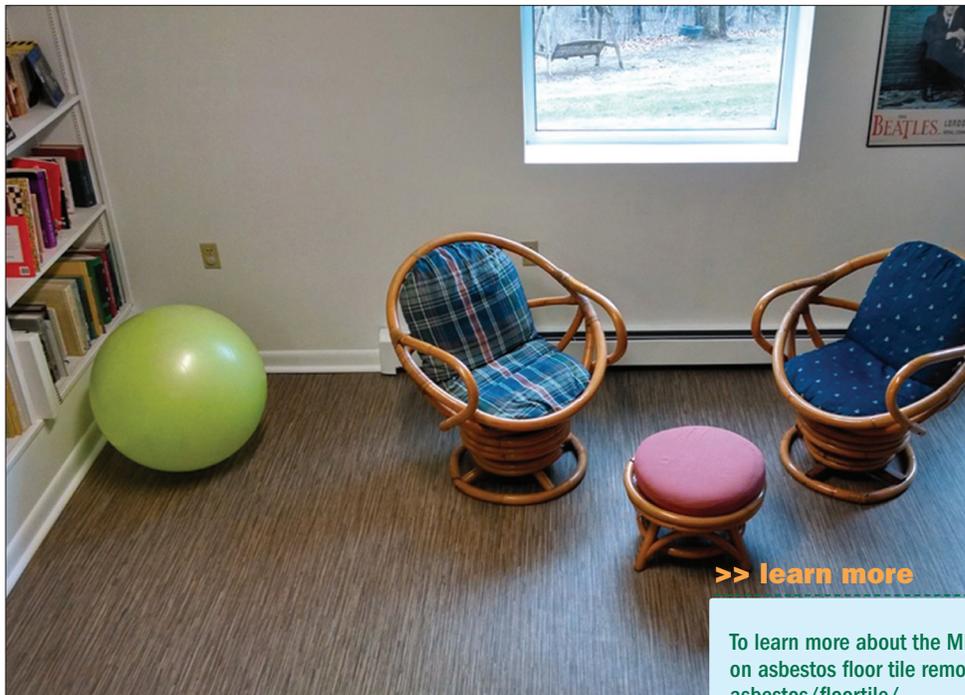
Epilogue

My husband's flooring pick won the day—he went for an eye-pleasing phony-baloney bamboo pattern. I figured if I could have my Scandinavian loft last time, he could have his Zen yoga studio this time. The flooring was put down barely in time for Christmas, which was a good thing because I didn't want my baby nephew crawling around on asbestos-containing mastic.

It looks pretty good, and as I enter a Zen-like state in my yoga studio, I can almost forget about all the horrors that lie beneath the slab. And I hope, after seeing my disgusting photographs, you can, too. Perhaps the whole experience was a very good reminder that we are all made of dust, and that our buildings are, in the end, a very thin separator between us and our ultimate fate as worm diet. Just something to think about the next time you are picking out floor finishes.

I thought at first that I might submit this article to *House Beautiful*, as I figured they might be short on worm-related stories, but I felt the loyal readers of *Home Energy* would somehow be more appreciative. I hope I am right. 

Elizabeth Grant is an assistant professor at the School of Architecture + Design at Virginia Tech. She teaches courses in architectural design, environmental design research, and environmental building systems.



Above, the professionals come in and remove our asbestos. Left, the finished product with worms safely beneath.

[>> learn more](#)

To learn more about the Minnesota Department of Health instructions on asbestos floor tile removal, go to www.health.state.mn.us/divs/eh/asbestos/floortile/.