

The **Fine Homebuilding** Interview

Kristof Irwin

A professional engineer offers a consilient view of building science that prioritizes human thriving

BY AARON FAGAN

A principal of Positive Energy in Austin, Texas, professional engineer Kristof Irwin has an expanded view of building science. He asserts that any definition of the discipline is incomplete without accounting not only for the house as a system, but also for the fact that a home operates as a node in a larger societal and planetary system.

“The paradigm needs to change,” Irwin said during our interview. “Fundamentally, homes should be about human thriving.”

And he believes this is an attainable goal—one that isn’t reliant on unrealized technologies of the future. The building industry needs to undergo a cultural shift, he says, and all of us need to cultivate a new relationship to our homes and all that they embody.

According to Irwin, we have the tools we need already to create long-lasting, healthy homes. He asks us to consider this question: Is it time to stop focusing on doing things better and start focusing on doing better things?

AF: How would you describe the focus of your building-science practice and work as an engineer from a cultural point of view?

KI: I really want people to rethink what it means to live indoors. We view an indoor environment as though it’s merely visual, spatial, and economic. When I say we, I mean those within the architecture, engineering, and construction professions. As a result, homeowners and developers are complicit in that view. However, from a very pragmatic standpoint, when we talk about actually being in your home, what we really mean is you are in the air contained by your home, and that means being in a highly immersive tactile situation where visual, spatial, and economic concerns must be secondary to human health.

For example, phthalates are a class of chemical plasticizers used in myriad building products. Even if you put indoor breathing aside, we can still get a substantial transdermal uptake of these chemicals, which are now being linked to a wide variety of health concerns.

That is one of many facts we are going to have to confront in the building industry regarding the health of our built environments. The paradigm needs to change. Fundamentally, homes should be about human thriving. We cannot put the very systems upon which we provide energy and resources for our homes, which are in natural ecosystems, out of that view. In thermodynamics, for example, you define a boundary, and what we tend to do is define the boundary around the home or the lot. That myopia is inappropriate and damaging.

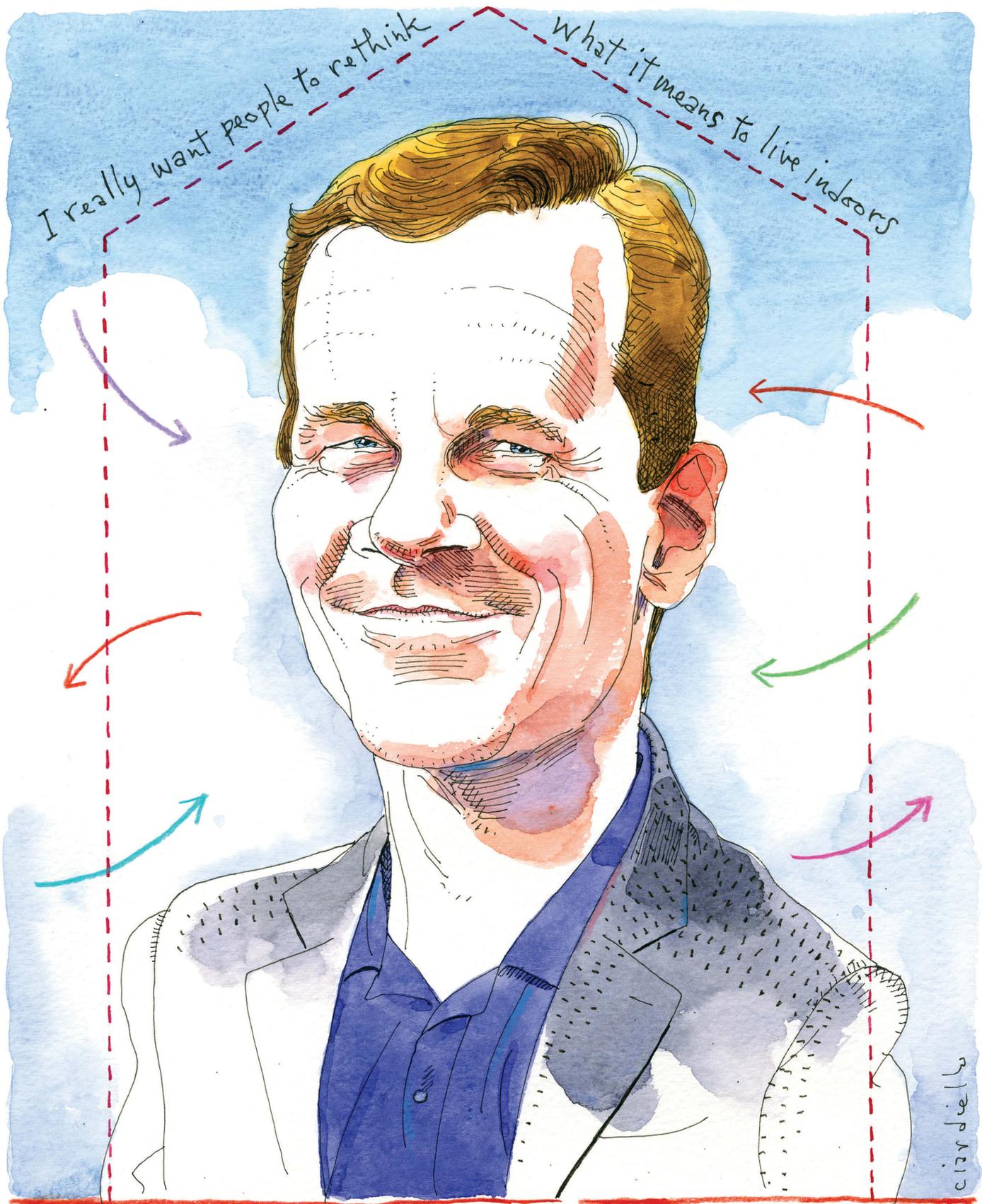
I’ve been rethinking what it means to practice building science, which has been conventionally described as systems theory applied to buildings based on the physical sciences. That last piece is very important; typically, it’s the classic sciences like thermodynamics, hygrothermal dynamics, or, more broadly, physics, chemistry, biology, geology, and engineering disciplines. However, what’s critical to systems thinking is accurate timely feedback. That principle is huge for the role *Fine Homebuilding*

plays in the culture of home building. One of the most crucial developments for the steam engine was the centrifugal governor. It provided accurate timely feedback of the pressure buildup, which turned it from a grenade to an engine. Culture change is complicated because the very systems we rely on for accurate timely feedback to our society are working through implicit biases.

Where building science is concerned, the elephant in the room, the “emperor has no clothes” reality, is that there are essentially no compelling constraints to keep us from making fantastic buildings. And I mean multiple simultaneous dimensions of quality. These buildings could last 500 years, they could provide flawless air quality, and they could help improve sleep, life expectancy, cognition, and emotional regulation. We know how to design environments to promote human thriving, but we don’t do it.

AF: Why don’t we do it?

KI: Well, it’s not because we are waiting for some invention of appropriate materi-



als or technologies. It's because society is not asking us for those outcomes. Society is stuck in outmoded visual, spatial, and economic ideas. Something is wrong with the system when builders and developers see the houses they build as an economic asset for themselves.

So, my point of view is that systems thinking is important, but that it's incomplete without social science. It needs to include behavioral psychology. We are offering food for thought here. *Fine Homebuilding* offers nutrients to this ecosystem, but the ecosystem needs to recognize these as nutrients and consume them. The field of building science has been offering food and society is saying, "I'm not hungry."

I think building science should be using architecture, engineering, and systems thinking to design and build beautiful buildings that achieve practical outcomes. And when I say systems thinking, I mean an expanded view.

AF: There is no sense in talking about window flashing and vapor control if we don't know why we are doing what we are doing.

KI: Exactly. If someone says "vapor permeance" to me one more time, I think I'll explode. It's as if we have a group of architects and builders at a job site and there is a huge pile of dirt we need to load into a truck, and we are lost in conversation about the shovels on the ground. Does it have a long or short handle? Is it flat or pointed? Hickory or ash? What we need to do is pick up the shovel closest to us and get to work.

People need to recognize that the dominant pollutant-source exposure in our society is the air breathed in the home. We breathe 30 lb. of air per day, and that's if we're not exercising. Where does it go? It goes into our blood. It quickly crosses from outside of me into something I call me. Those pollutant particles go from the air around us into our blood and they have myriad health effects. Covid-19 has gone a long way toward making the invisible substantive.

We are really at a point in our societal evolution where homes can be an essential part of the solution to the challenges we face. The climate solution in particular. But we

need to prioritize human thriving in the homes we build.

AF: Health risks appear inextricably linked to other risks.

KI: One of the most hopeful things I've learned recently is that firms like BlackRock—with nearly \$9 trillion in assets under management—are recognizing the enormity of these environmental issues. Larry Fink, BlackRock's CEO,

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wrote in his January 2020 annual letter that "climate risk is investment risk." So, what we have is an extremely powerful system of systems—I'm talking about the financial and banking sector—and they are urgently calling for transparency regarding climate risk. Banks are cleansing their balance sheets of investments that they view as exposed to climate risk, because if they don't know where the risks are, how can they make decisions for their investors? This has already happened in Europe. It's happening in Asia. The financial and banking sector says it's urgent for companies to disclose these risks. Now apply that to the building industry.

AF: That's the paradigm shift. That will have cascading implications.

KI: That's exactly right. Think about the way we generate and deliver electricity to our homes. Utility companies are still using outdated science from the '80s and '90s. That's a major source of distortion. A report with detailed modeling was released last December by a group called Vibrant Clean Energy in Boulder, Colo. It will require a major investment to bring it to scale, but if we invest in clean-energy renewables and distributed storage, this model shows that we can save close to half a trillion dollars in the next 30 years. But we need to think differently and go away from traditional practices.

However, the inertia of traditional practices is significant. We have generations of mostly men in the construction industry who would have to face a lot of pain. It means developing a huge amount of humility in order to really get new momentum behind this transition. They need to say to themselves, "My actions and decisions over the course of my life and my career—including the ones I'm making today—are actually part of the problem." I say this to myself, and it's hard. It's not easy, but I know it's the truth.

I can face that truth, and it's not comfortable. One of the most important changes the building industry needs to make is that its systems exploit the environment, exploit labor, and promote a host of other unjust practices. We can't shy away from the negative emotions that conjures. That's feedback. As we stated before, systems require accurate timely feedback.

I think there is no other reality than the fact that the climate is weirding. Humans need to radically—and I mean unrealistically fast—change their behavior. That's really hard, and it's going to be challenging. But what's happening right now is that we're not even admitting that we need to do that wholeheartedly and with unified voice. That last piece, "with unified voice," means there is no way around the fact that—grudgingly, over time—everyone will have to stop the party, go through the hangover, face reality, hit bottom, and say, "Yes, this is real. It's happening, and we need to deal with it."

There is a subtle form of optimism in there in the sense that there is no other forward. There's no other future than gradually people will come to face this reality and accept it. When that happens, powerful change can happen rapidly.

AF: How would you reframe our definition of building science?

KI: I really see that building science needs to expand its purview and its understanding of systems. And I see it in three main areas: planetary systems, human systems, and digital systems. We've talked a lot about planetary systems. The good news there is that climate risk is investment risk. Planetary systems are about how we avail

ourselves, our families, and our entire society and economy of energy and resources harvested from the planet.

An example of a human system would be that I am an engineer, and I work with architects, builders, contractors, consultants, code officials, inspectors, appraisers, underwriters, bankers, insurers, legislators, commissioners, lobbyists, industry associations, and media outlets including magazines, podcasters, bloggers, and influencers. Every human interaction has an impact.

What my local HVAC distributor chooses to carry, for example, impacts my ability to design, which impacts my installing contractor's ability to move into the future. What I'm driving at is this expanded building-science systems perspective, and it really includes each individual as a node in a giant mind. And when it comes to human systems, how do we avail ourselves of adjacent expertise?

Medical science, social psychology, behavioral science, behavioral economics, and even marketing and consumer behavior are subjects of expertise. So, there's all these adjacent expertise sets, and here we are in 2021—it's not OK with me that they're siloed next to me. I really feel that for me to do my job, I need to understand that I don't understand. I have a small purview; I need to ask questions. I need to be able to face the fear and doubt that recognizes that what I've done in the course of my career, while traditional, was unskillful. That's a tough thing to ask for.

We have to ask ourselves what's on our dashboard when we move through the world, because those instruments shape what we see. You can put profits and consumer preferences on there, but I want to add health and wellness, thermal comfort, operational and embodied energy, and community and environmental health. So, we've had the wrong dashboard. Can you blame people for not charting a skillful course? Is it any wonder when we look at what has been prioritized? No.

And then the last one is digital systems. The psychologists who work for big tech fuel the attention economy, and that has bred an age of distraction with huge side effects. This goes back to the beginning of our conversation: If you want to understand something, think about the intent.

Big tech, along with advertisers, are getting the outcomes they were after.

AF: There's a lot of stored power and intention in tradition.

KI: We shouldn't bemoan the fact that traditional practices are powerful. That is deeply built into our mammalian selves. Tradition is like guardrails. But, we're supposed to be thinking beings, not just traditional beings. Traditionally speaking, the practice has been to create buildings out of basically cheap interchangeable parts so that we can apply low-skilled, exploitable labor, and get a very low dollar-per-square-foot building that looks like a nice home but isn't. It has interior finishes and gadgets, but don't peel back the walls! We didn't optimize it to be a nice home, we only optimized it to look like a nice home delivered

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at a low first cost. And given that that has been our intent, we're doing a good job.

I talk about the important difference between doing things better and doing better things. We are engaged right now in the building world with a constant search for doing things better—better wall flashings, better insulations, etc. I think it's a really timely opportunity to break from that tradition and start thinking about doing better things. Are we prioritizing embodied carbon? Are we prioritizing health? Doing things better has an implicit basis in traditional behavior. Doing better things means thinking, what aren't we thinking about?

One of the things I think drives our deep fear and concern in the United States building industry—and has us resisting acknowledging it—is the fact that traditional practices are failing us. We don't want to admit that. Why? That issue makes us bristle so much because in our heart of hearts we don't trust ourselves to take care of it. We're not sure that we're up to the task.

Our behavior communicates that we're not sure human nature is basically good, creative, intelligent, and caring enough to deal with this problem we've created.

I will for the rest of my life stand firmly on the idea that we can do this. We can do better things. We can make this happen, but I can also feel the doubt. I think that doubt in humanity's ability to fix this issue is a source of a lot of resistance to the willingness to change. We need a lot of people producing better things instead of just doing things better.

I can nerd out about European versus U.S. filtration standards, but what really enlivens me and what I really feel connected to right now at this point in my career is this question: How do we get society to admit that it's due to do things differently? It's fascinating. As an engineer who wants society to thrive, I am starting to recognize that it's not by doing engineering, it's by getting society to ask me to do better and better things. It's a weird kind of place to be as a quantitative, technical person. It's very clear to me that the problem is not quantitative or technical; the problem is deeply emotional. We need cultural things that help galvanize societal will.

How do we get there? How do we get past seeing a home as a visual, spatial, economic situation and see it more fully as a deeply tactile situation that influences our very cognition and emotional state? It's so much more interesting, but we don't want to go there. Fear is always a story in the mind about what happens next. There are different types of dopamine receptors in the brain, and one of them is associated with the anticipation of the cessation of suffering. It sounds kind of Buddhist. That dopamine trigger is like finding the solution to a problem, and thinking therefore that the problematic situation is nearly gone. That's not the reality. We don't think of the fact that we are going to put a mammal into this box we built, and our felt sense of an indoor environment is vastly dominated by unconscious inputs we can no longer ignore. □

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