



ANNIE, Get Your Screw Gun

A FULLY WIRED DOLLHOUSE FOR THE
ENGINEER STILL IN PIGTAILS.



IT'S A CHILLY WINTER SATURDAY, and the gray flooring at Roominate's headquarters/toy-testing space in a Mountain View office park is littered with scraps of old socks and brightly colored felt, teal and sky blue building pieces, battery packs bristling with wires, and three very intent little girls.

Michaela, 11, clicks two plastic squares into a rectangle, completing a tiny couch exactly like the one in the package insert. She's making replicas of everything shown—the dining table, the bunk bed, the table saw, the treadmill—and lining them up in front of her in a pastel parade.

Her nine-year-old sister, Anneka, meanwhile, has slyly hoarded every circuit around and is attempting to get her night light, washing machine, and fan to run off a single switch. But the multiple wires tethered to the dollhouse walls are proving awkward, and she's trying to Scotch-tape the problem away. Seven-year-old Emma, in a magenta tunic, could care less about electronics. She's enthralled with the dozens of stickers that come with the dollhouse kit, arranging them across the three white plastic walls she's configured into a bedroom. "There are even teensy ice cream cones," she sings out.

Roominate's creators, Alice Brooks and Bettina Chen, watch with feigned casualness. This isn't some impromptu playdate, after all; it's a focus group. And the little girls aren't necessarily exploring the toy the way that the founders want them to. It frustrates Brooks that so many kids ask, "Where are the instructions?" "If they just played with it a little bit, they could figure it out," she says. "We worked really hard to say 'Here are some ideas, but you can really do anything.'" It goes without saying that Brooks is a tinkerer: For her, the fun is using the plastic shapes and circuits to make something novel. "I was so excited when I built a





LIFE IN 2023

David Morrison

DIRECTOR OF THE CARL SAGAN CENTER AT THE SETI INSTITUTE, ASTROBIOLOGIST AT NASA AMES RESEARCH CENTER

ALIENS!! (MICROBIAL, BUT STILL)

“If all goes according to plan, in 2020 we’ll be looking for microbes living under the surface of Mars. If we do find life in those underground aquifers, we’ll analyze it and discover one of two things: either that these microbes are made up of DNA and RNA and are therefore distantly related to us, or that they’re made up of something entirely different, which would mean that we had found a completely alien life-form for the first time—Martians, but small ones, not the walking, talking aliens of our imagination. One day we might find intelligent creatures, but they may have a different chemistry and not look like us at all.”

Sophie O'Connor, 8, and Bridget Tucker, 7, put Roominate's dollhouse kit to the ultimate test.

“Growing up, it was really normal in my home to be building things. Only later did I realize how unusual that is.”

Roominate's Bettina Chen (left) and Alice Brooks



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little elevator with a pulley so it could move up and down,” she says.

But what she and Chen would do if they were Michaela or Emma isn't the point. The point is that so many of the hundreds of kids they have observed playing with the Roominate kits—the sequined-tutu types, the tomboys, the pip-squeaks, the tweens—are completely absorbed. “When girls are all telling their moms, ‘I'm not leaving!’ when the session is up—that's when you know you have something,” Brooks says.

Brooks and Chen are 25 and 24 respectively, but in their skinny jeans and flip-flops, they look closer to 15—young enough to recall how much they loved constructing and crafting as kids. Brooks was raised in a robot lab with grad students as babysitters, playing with miniature power tools alongside her Barbies (her dad was a robotics professor at MIT). Her mother was an early DIYer: “When I begged for Barbie clothes, Mom said, ‘Make them.’” The more laid-back Chen, who grew up in Seattle, was smitten with Beanie Babies, but also with her older brother's Legos. “It was really normal at my home to be building things,” she says. “Only later did I realize how unusual that is.”

Now Brooks and Chen are Stanford-educated engineers on a not-so-secret mission to inspire a generation of girls to grow up to be scientists, inventors, and explorers. The Roominate kit, marketed by their year-old company, Maykah, may look like a construct-your-own dollhouse, or bowling alley, or palace. But it's really a stealth learning lab, designed to stretch little girls' brains until they explode with so many exciting possibilities that the spell of even the most powerful Disney enchantress is obliterated.

BROOKS AND CHEN first locked eyes at orientation for Stanford's engineering master's program in 2010. They bonded instantly, as females tend to do in a graduate program that was 83 percent male. Even as undergrads at nerdy MIT (Brooks) and California Institute of Tech-

nology (Chen), they weren't used to being so outnumbered. “It made me miss my East Coast girlfriends even more,” Brooks says.

That gender shock was part of a phenomenon that has become increasingly worrisome to educators, researchers—even President Obama. “We've got to lift our game up.... That's why we're emphasizing teaching girls math and science,” he said in a May 2011 speech. In high school, girls and boys start out studying math and science in equal numbers, but by grad school, American girls are slipping way behind. The gap widens in the working world, where 87 percent of engineers, and 65 percent of scientists as a whole, are male. No matter that women in STEM (science, technology, engineering, and math) careers earn 33 percent more than those in other fields, or that by 2018, according to Commerce Department projections, 9 of the 10 fastest-growing occupations will require significant STEM training. The shortage of girl geeks has become so dire that in 2011, Etsy had to fund a hacker school to boost its roster of female engineers from 3 to 20.

Brooks and Chen's quest to change all that began in Stanford's popular “Lean LaunchPad” class for budding entrepreneurs. Determined to come up with a startup idea more meaningful than a new kind of pedometer or another karaoke app, they asked themselves why they had become engineers in the first place. “It's because growing up, I loved making toys and other things,” Brooks says. “I think more girls should have that.”

One of their first advisers was professor Sheri Sheppard, an expert in engineering education whose research—on topics like what makes high school math and science compelling—has left her convinced that early play holds one of the keys. The problem isn't so much the obvious cultural stereotyping that pushes boys toward blocks and cars and girls toward dress-up and dolls, Sheppard says. It's that active “boy play” (including throwing and

hitting and kicking all those real and digital balls for all those years) turns out to be much better for developing the kind of spatial skills—translating 2-D instructions into a 3-D skyscraper or rotating a shape in your head—that are now widely believed to correlate with STEM success. Toddlers who spend time doing puzzles over several sessions score higher on mental rotation tasks when they get to preschool. Fifth graders who play Atari’s *Marble Madness* maze game significantly increase their spatial skills, while kids who play word games do not. The most famous feminist in tech, Sheryl Sandberg, is always hammering this point—“Let your daughters play video games,” she urged at a recent panel on jobs and competitiveness. The good news is that kids’ brains seem easily retrainable. “When you just expose girls [to tasks requiring spatial skills], they get right up to the same level as boys,” Sheppard says.

But finding a toy that makes girls actually want to play like their brothers—now that’s a challenge. Wander the aisles of Toys “R” Us and you see what happens when mainstream manufacturers try to think like an army of Marissa Mayers: pink and lavender Legos and Computer Engineer Barbie.

Chen and Brooks had their own share of rookie missteps. Their first concept was a pig-mobile—a pink body with a snap-together chassis and attachable wheels, heavy on the glitter. “We wanted something mechanical that girls would build,” Chen says. But when she and Brooks showed Peggy the Pig to some girls for feedback, it was not love at first sight. “The only squeal we got was over a stuffed hamster that one girl ran and grabbed out of her room,” Chen says.

“Peggy was chocolate-covered broccoli,” Brooks says. Even blinged-out and disguised as the cutest critter ever, cars and trucks just don’t appeal to the average wannabe Ariel or Belle. “It was like we were trying to put educational elements in, and they could tell.” Lesson no. 1: “The building part had to be more seamlessly a part of the experience,” Chen says.

Their next idea, a sewing-kit takeoff on Tangrams—a puzzle

game with geometric shapes that are arranged to form other shapes—also struck out. So did their make-it-yourself LED light-up bracelets and glowing felt purses. Then, one afternoon, taking an X-Acto knife to an empty oatmeal carton, Chen and Brooks constructed a house using simple squares and rectangles, with rooms scaled to fit the Polly Pocket figures that little girls adore. They filled it with Popsicle-stick furniture, tiny paper plants, and groovy chairs made from an old pink mop. The *pièce de résistance* was a simple circuit—just two wires welded together—that powered a bedside light. This time, Chen and Brooks had little girls elbowing each other out of the way at Maker Faire for a chance to play. The requisite Kickstarter campaign raised \$86,000—three times the goal—in a month.

The product now called Roominate has gotten much sleeker and hipper, as would be expected for a toy that costs from \$59 for the single-room version to \$225 for the deluxe château. But the basic idea is the same: attachable pieces and electronics that can be used to make virtually anything a little girl can think of, from the walls of a beach cabana, to a whirring mini-blender for whipping up pretend strawberry-banana smoothies, to a triple-decker bed to accommodate doll-size pajama partyers. Girls create pet stores with little cages and tiny bones in tiny bins, and restaurants with waiters equipped with teensy iPads to take orders for itsy-bitsy fries. A motor turns the world’s fastest spinning cupcake table. The electronics don’t feel like Hershey’s-covered science lessons, but rather like tools to make make-believe more exciting.

This, as it turns out, has been Roominate’s biggest aha: Girls tell stories. They’re obsessed with dramatic play. They relate to characters with relationships and problems. “When we brought some popular toys”—a Lego figure, circuits—“to observe how girls play, they combined the unrelated things into a giant story,” Chen says. “We never expected that.”

It’s an insight backed by piles of research: Girl babies gaze at moving faces longer than at moving cars.

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Little boys build towers of blocks to see how high they can get; little girls use blocks to further the narrative. What's more, stories help girls, in particular, retain information. When Boston College educational psychologist Beth Casey, a pioneer in the study of gender, spatial skills, and math, embedded geometry lessons in stories, girls tested better on the concepts than those who were taught with numbers alone. "With girls, you need a more structured kind of situation, where the skills you want them to learn are provided through the context of story or through the requirements of the activity," Casey says. "I don't mean direct instruction—I mean scaffolding." This type of invisible structure may be the most important part of what Roominate groupies are building, and they don't even know it.

CHEN AND BROOKS shipped 3,000 Roominate kits this past holiday season, packed with the help of Chen's Frisbee team and both of their boyfriends. "They've figured out it's the only way they'll see us," Brooks says. The rush was motivated by their mentor, Mike Cassidy of Google X, whom they met through StartX, a Stanford incubator for student businesses. "Speed is the ultimate startup weapon," he told them. "His view is that it's better to jump in and learn by doing than to wait around trying to perfect everything," Chen says.

Indeed, the indie Roominate will have to move fast if it wants to break through in an industry dominated by mega-brands. After five years of research, Lego introduced its Friends line in 2012—building blocks with BFF figures that road-trip in their pop-up adventure camper or play soccer. The Barbie Build 'n Style line is girlier: pink blocks that transform into ice cream carts or boutiques. There's even competition from another Stanford-educated engineer: 30-year-old Debbie Sterling, creator of GoldieBlox, a new book-interactive toy combo whose main character tears apart her music box to figure out its inner workings and devises a cookie-swiping machine. Roominate and GoldieBlox are inventing an entire category of toys, says Berkeley toy analyst Stevanne

Auerbach (aka Dr. Toy). "A computer engineer Barbie is a step forward. But Barbie also needs to learn to do math and fix her computer—and to understand the tech behind all this. The integration of circuits and building and education is really new."

Still, there is some skepticism about how the concept actually delivers once in little girls' hands. "One question I have is, how will the girls play with this," says Susan Levine, chair of the University of Chicago's psychology department. Will they do the building and electronic tinkering? Or will they let their parents take over? Will well-meaning, understandably envious moms and dads be able to stop themselves from helicoptering this aspect of their kids' lives, the way they hover over so many others?

Levine asks whether Roominate isn't playing into stereotypes more than combating them. "We would like girls to do spatial activities not just around pink things," she says.

Chen and Brooks don't pretend that their product will close the STEM gap. Nor do they deny that some girls will do little but stick stickers. Still, they are sure that they're on to something. Photos of girls mugging with their creations keep flooding in, and, other than one disappointed *Forbes* reporter who thought that the hefty price warranted more electronics, the press has been stellar. Chen and Brooks lost their third partner, a Stanford MBA candidate who was involved early on, but have managed to get manufacturing going in China, break into Amazon, and raise enough funds to keep going "for a while," Brooks says.

Meanwhile, they are busy devising new electronics—a buzzer and a light—and reworking the tangle-prone battery wiring. Solar panels to power the circuits are in development, as are levers and pulleys. "At some point, we want girls programming," Chen says. Sure, some kids are clamoring for more decor options, but Chen and Brooks are committed to including something electronic in every add-on pack. "It would be higher margin to just give them more stickers," Chen says, "but that's not the mission."