

Catlin Powers has converted her concern for the environment into lifesaving energy technologies.



# A BURNING PASSION

*When Catlin Powers first stepped into a nomadic family's canvas tent in the Chinese Himalayas, she was overpowered by the smell of burning yak dung, the traditional source of fuel. She almost choked on the thick yellow smoke that spewed out of the family's stove and hung in the air. Her eyes and nose stung, and her eyes started watering—just like those of the woman leaning over the stove, boiling water for tea.*

Powers, SM '11, SD '14, became so dizzy that she had to step outside, where she noticed the same thick smoke billowing out of rows of other tents. She had come to this region—in the Qinghai province of Western China—as an eco-conscious undergraduate, planning to address outdoor air quality. But this visit completely altered her plans.

“The family questioned why there was such a huge scientific effort focused on climate change and outdoor air pollution when the smoke from their stoves was so much thicker than what they could see in the blue skies outside,” Powers says. “I ended up bringing my equipment inside their home and we measured the air quality together. We discovered that the air they were breathing was ten times more polluted than the air in Beijing.”

Catlin Powers, left, meets with a woman from a semi-nomadic village in Gansu, China who used an early SolSource cooker prototype.

She immediately postponed her next semester of college to stay in this remote village and help solve its indoor pollution problem. Within five years, she would become not only a cutting-edge environmental researcher and PhD candidate, but also an even rarer breed: a public health entrepreneur combining indigenous know-how with modern investment tools, including a hugely successful Kickstarter campaign.

## A KNACK FOR ADAPTING

Powers' upbringing prepared her well for such a decisive shift in plans. Growing up with two academic parents, she had lived in almost a dozen countries, from the U.S. and the Netherlands to South America and Asia. The itinerant lifestyle taught her to adapt quickly, and to forge much of her own education from the conditions—and problems—she encountered. “From a young age, I was fascinated by how people use

resources, how waste goes out into the world, and what we can do to live in a more sustainable way,” Powers says.

She attended Wellesley College, intending to go into international relations. But then she took a chemistry course and fell in love with the subject. “I spent every waking moment thinking about chemistry, reading textbooks, being in the laboratory, so much so actually that my skin became really pale. You could see the veins underneath.”

That's when she realized it was time to bring her scientific passion out of the lab. She booked a flight to the mountains of western China, ready to study climate science in the field.

## FINDING GLOBAL SOLUTIONS IN THE HIMALAYAS

The Himalayas have always struck Powers as a harbinger of global environmental changes. Glaciers in the Qinghai region provide water for 40

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percent of the world's population—but over the past 50 years, the ice sheets have shrunk by 5 percent. During the same period, the Himalayas have heated up six times faster than the rest of China, and more than twice as fast as the rest of the world. Powers thought if she could help find environmental solutions in that supremely challenging environment, she could have a global impact.

After her indoor-smoke epiphany, she moved into her own hemp tent and began to follow the villagers' routines—especially those of the women, who ran the households. Powers had to learn to haul water on her slim frame, eventually helping design a special backpack to stop the water from sloshing down her back. She accompanied the women on their fuel runs—often deep in the forests, dodging local police, to collect illegal firewood. She also joined them in

the fields to collect yak dung, doing her best to find the dry, dense pieces that are best for fuel.

“I couldn't tell which one was wetter or drier, which one was more trampled,” Powers says. “The women made fun of me, saying, ‘Oh, you would never be able to get married here because you would make such a bad wife.’”

#### SCIENTIST AND ENTREPRENEUR

The immediate goal she had in mind—reducing the overall need for fuel through sun-powered cooking—would also address fuel scarcity and indoor pollution. After she completed her undergraduate degree, her work attracted the attention of Majid Ezzati, Harvard School of Public Health adjunct professor of global health, who encouraged her to pursue her project while obtaining a doctorate; her

## Kickstarting a Public Health Breakthrough

Catlin Powers and her colleagues chose a novel way to finance the development of their SolSource solar cooker: a campaign on Kickstarter, the popular online platform for soliciting pledges for creative and independent projects, from movies and books to clothing and new technologies. Powers knows of no other public health venture financed this way.

The Kickstarter campaign, which surpassed the team's original \$43,000 goal by \$100,000, enabled Powers to test the viability of selling the cooker in affluent markets, which in turn helps underwrite the cost of the cooker in developing nations. The campaign was cannily pegged to national holidays in the U.S. when grilling is popular—such as Fourth of July and Labor Day. Along the way, Powers found unexpected perks in the online fundraising forum: beta testers for the solar cooker, analytics that helped her company glean the wishes of potential customers, and a loyal and engaged customer base. As Powers sees it, “At a time when government support is uncertain, Kickstarter has become an efficient funding mechanism for public health innovations.”



Nomadic villagers burn yak dung on an adobe stove inside a tent on the Himalayan plateau, where Catlin Powers carries out her research.



In a nomadic village in Qinghai, China, a woman prepares a traditional noodle soup that will be cooked on the SolSource cooker, at right.

research was supported by the U.S. Environmental Protection Agency, and her tuition covered by the National Science Foundation. At HSPH, the solar stove project became the focus of her dissertation, which her adviser, Jack Spengler, SM '73, Akira Yamaguchi Professor of Environmental Health and Human Habitation, says “she has pursued from the perspective of both a social entrepreneur and a research scientist.”

Powers learned that Himalayan families would use only a solar cooker powerful enough to boil water at high altitudes for tea and tsampa (a tea-and-butter-filled dough soup) and capable of reaching high enough cooking temperatures for traditional stir-fry dishes. She tinkered with many designs, none of which generated much interest—until a local clan leader offered advice. “He said, ‘I’m sure these technologies are good,’” Powers recalls. ““But the biggest thing that motivates

people to make significant change in their lives is the promise of a rise in status or living standards.”

The early designs looked too much like what the villagers had used before, so she set about inventing something sleeker, more

campaign. The stove looks like a large satellite dish, with shiny silver panels that curve upward and a platform in the middle for a pot or pan.

Innovative financing lowers the cost for villagers below the \$400 U.S. retail price—low enough so that most

“When I visit the villages, some of the women come running up to me and say, ‘I can’t believe it, my husband actually is cooking!’”

modern, and more efficient. Funded by grants, consulting fees, and research prizes, Powers and her research team tried out 54 solar stove prototypes over five years, seeking the right balance between durability, power, portability, safety, and tasteful aesthetics.

#### A WORLD POWERED BY THE SUN

In 2012, Powers launched the SolSource cooker, the first major product in what would become her tech company, One Earth Designs, co-founded with Scot Frank and funded through a Kickstarter

can afford it but high enough to make the stove a status item.

SolSource has since made its way into some 2,000 households in the Himalayas and 300 more in 17 other nations, from Asia to Latin America. Fuel use has dropped by 30 to 70 percent among SolSource users. The company is now looking to expand into more affluent markets, moving away from the nonprofit model and toward an independent investor-funded venture. One Earth Designs surpassed its \$43,000 goal on Kickstarter by \$100,000.

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As she collects data on changing fuel consumption and pollution trends in the Himalayas, Powers is also gathering anecdotes about the social impact of the solar cooker. For example, its novelty has rearranged the traditional division of labor within the family. “When I visit the villages,” Powers says, “some of the women come running up to me and say, ‘I can’t believe it, my husband actually is cooking!’”

#### ENDURING HARDSHIP

The success of Powers’ project has not come without personal cost. While working in Qinqhai, she contracted a multiparasite infection that completely debilitated her, with pain, fever, vomiting, skin rashes, and delirium. She credits her HSPH advisers for saving her life. They went to great lengths not only to locate her—no easy feat in such an isolated area—but also to arrange for evacuation to a hospital

in Hong Kong, where she spent two and a half months. All the while, she continued typing out ideas for her solar cooker, using the hand that was not hooked up to an intravenous drip.

Jack Spengler still worries about Powers returning to high altitudes to continue her work. But he knows that the same qualities that put her own health at risk are those that make her such a promising force for public health. “Some students are just handed data sets and told, ‘Analyze them,’” Spengler says. “Catlin decided to take her project to a remote area of the world, endure incredible hardships, and overcome them.”

#### CHANGING OUR FUEL HABITS

The Global Alliance for Clean Cookstoves estimates that 4 million people in the developing world die each year from smoke exposure to fuels like yak dung, wood, and crop residue. Powers says those popula-

tions are trying to change their fuel habits, but she fears they could move in the wrong direction.

“We live in a moment in history when millions of families are transitioning from traditional fuels to modern fuels like coal,” Powers says. “This transition could be disastrous for people and the earth—or it could be an opportunity to produce clean, convenient renewable energy available on a mass scale.”

That’s where her work comes in. “I would love our products to be not only symbols of transition towards a better future in developing nations,” she says. “I also would love to see them adopted by people in developed nations, who are still searching for ways to live in a sustainable way.”

*Karen D. Brown, an award-winning radio and print journalist based in Western Massachusetts, specializes in health issues.*

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Dominici’s practical suggestions: alter airplane design to dampen engine noise; soundproof houses and other buildings near airports; reroute existing or future runways away from residential areas; and monitor the cardiovascular health of elderly residents who live near airports.

The policy implications of Dominici’s work would seem to extend to environmental noise more broadly. But making that leap isn’t easy. For one thing, it’s hard to assess whether a common and pervasive environmental exposure like noise contributes to disease, because there can be widespread confounding factors, such as smoking, alcohol, diet, age, or preexisting illness.

“In environmental policy, there’s an interesting dilemma,” Dominici says. “You have to figure out the right culprit, because people are exposed to many things at once. If I don’t isolate the specific source of the noise—if I just conclude that noise in general is bad for you—then the results won’t be translated into policy. The automobile industry would say, ‘It’s not my fault.’ The music industry would say, ‘It’s not my fault.’”

The hurdles to action, she adds, are political. “Environmental studies try to narrowly isolate one environmental exposure from another. Because to change policy, you must be able to point your finger at exactly what is making people sick.”

—Madeline Drexler is editor of Harvard Public Health.

