

Pulses



Fabian Ruf (center) leads a Helping Hands Network teacher training session in Liberia.

Courtesy of Helping Hands Network

PROFILE

Inspiring a Better Future

Fabian Ruf, the 2023 recipient of the Optica Foundation's Chang Pivoting Fellowship, is passionate about transforming the world through education.

Stewart Wills

Fabian Ruf remembers his first flight into Monrovia, the capital of Liberia, in 2014. Ruf, then an optics master's student who had grown up and been educated in comfortable circumstances in Europe, had watched London's brilliant lights recede at the flight's outset. Only hours later, looking out the window as he approached Monrovia, "there was just nothing"—scarcely any visible lighting, in the largest city of an African country still recovering a decade after the end of a devastating, 14-year civil war.

That flight began a 10-year personal journey for Ruf. Since then, he's used much of his time, alongside his own education and professional work, to serve the Helping

Hands Network (2HNet), a Liberian project aimed at boosting the training of the country's science teachers. And, as the 2023 recipient of a US\$50,000 grant from the Optica Foundation's Milton and Rosalind Chang Pivoting Fellowship, he's hoping to further benefit the network's goals by tackling a key challenge: the lack of relevant teaching materials and supplies.

While 2HNet is a grassroots operation, focusing on a handful of teachers in just one African country, Ruf believes such work can have a profound impact. "If we inspire a few teachers there, and they inspire their students, they will have that passion over many years and inspire many

more,” he says. “When you start with small things that change lives, they will change other lives. And that’s something of value.”

Toward a “lasting difference”

2HNet grew out of the experience of its Liberian cofounder, J. Wilfred Zeon, as a refugee in Ghana during the civil war. There in 2010, in the Buduburam refugee camp near Accra, Zeon met Tilman Hartwig, an undergraduate astrophysics student at the University of Heidelberg, Germany, who under the auspices of an international aid agency had traveled to the camp to teach refugee students. Zeon and Hartwig quickly realized that, important as the education of students was, boosting the qualifications of the educators was equally vital.

“We knew that if we wanted to make a lasting difference,” Hartwig later told a reporter from Heidelberg’s *Rhein-Neckar-Zeitung*, “we had to start with the teachers.” He and Zeon began conducting teacher workshops in the camp, especially ones emphasizing basic math and physics. In 2012, when Zeon returned to his home country, the pair launched 2HNet as a nongovernmental organization to continue the concept in Liberia.

Fundamentally, 2HNet seeks to help build the country’s enormous but profoundly underutilized human capital. More than 62% of the Liberian population is less than 25 years old—a potentially huge pool of future talent. But the country still struggles to rebuild the infrastructure and public services, including education, that collapsed during the 1989–2003 civil war. As of 2021, Liberia ranked 178 out of 191 countries on the UN Human Development Index, with an estimated literacy rate of 48.3% as of 2017. And, according to a 2016 World Bank study, less than 34% of high school



Fabian Ruf (right), with Helping Hands Network cofounders Tilman Hartwig (left) and J. Wilfred Zeon (center). Courtesy of Helping Hands Network

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educators have the minimum qualifications needed to teach at that level.

A desire to give back

Even as Zeon and Hartwig were getting 2HNet off the ground in Liberia, Fabian Ruf was busily working toward his master’s degree at Karlsruhe University of Technology (KIT), Germany. And he was starting to feel that he owed the world something more.

Then immersed in the study of microresonators for biosensing at KIT, Ruf was keenly aware of his good fortune as a citizen of Germany, where education is largely free and even quality Ph.D.-level training is very inexpensive. “Already, during my

master’s, I felt like, ‘OK—but this is not enough,’” he says. “I feel so blessed to get all of that. But I want to give back something ... I was searching for a way to put that into practice.”

In one of those coincidences that can change lives, Ruf chanced to meet Hartwig while the latter, then also a master’s student, was teaching at another institution in Karlsruhe as a visiting lecturer. Hartwig put him in touch with Zeon in Liberia, and Ruf was soon making arrangements for his first flight to Monrovia. “I thought, ‘I will just fly there and see how it’s going,’” he says. He ended up staying six weeks.

The value of small things

After his initial orientation, Ruf dove into actual training work with science teachers from the region around Monrovia, in space provided by a local high school. He found a receptive and motivated group of pupils.

While Ruf stresses that there are highly skilled teachers in Liberia, he also notes that many persons from other trades entered service as teachers after the civil war, when

Liberia faced a sore need to rebuild its educational system. “They don’t have the background,” Ruf says, “and that is a challenge.” But it’s also an opportunity to make a difference—and has taught Ruf the value of what might at first seem like small things.

The teacher training by 2HNet, Ruf observes, is very hands-on. Occasionally it has involved helping the teachers understand how best to use goods from well-meaning but ill-informed donors in the United States and other rich countries, who have been known to send materials to Liberian schools without an adequate appreciation of the scarcity of electricity, internet and other basic services.

“We figured out a few things that can be used, and tried to show [the teachers] how to use them,” Ruf says. “And as soon as you show them something—something very simple; a magnet with filings, or a pendulum—as soon as they see it, they are so passionate; they say, ‘OK, I’m going to share this with my students.’” And the next time Ruf visits a school, he often sees the teachers doing just that.

“This is so rewarding,” he says. “It is so hard for us to impact students directly”—but it can be done “if you get a few teachers inspired.”

Teaching materials

Returning to Karlsruhe after that first trip, Ruf continued to build his own education and career, wrapping up his master’s in 2015, earning a Ph.D. in 2019 and doing a postdoc in the design and characterization of photonic integrated circuits at Denmark’s Aarhus University. This past October, he made the transition to industry, taking a position at Zeiss Group in Germany to work on that company’s own integrated-photonics effort. Yet he has taken 2HNet along with him on the journey, becoming part of the tightly knit, five-person core team

Ruf’s experience in Liberia has sharpened his perception of his good fortune and his desire to build a more equitable world.

working to drive the effort forward. And he’s returned to Liberia twice for multiweek stints of teacher training.

While Ruf stresses that 2HNet is “always a team effort,” he has taken a special interest in one challenge: the scarcity of good teaching materials, which he says is “always the biggest obstacle.” That’s not just at the high school level: “I’ve been at the biggest university there, the University of Liberia,” he adds, “and they also don’t have [sufficient] teaching materials.” To Ruf, that can hobble 2HNet’s mission of hands-on teacher training and motivation. “If all you have is textbook knowledge,” he points out, “you will never become inspired.”

To help address that obstacle, in 2023, Ruf applied for the Optica Foundation–run Milton and Rosalind Chang Pivoting Fellowship, which aims to provide funding to early-career scientists and engineers seeking to use their expertise to “improve society outside of the lab.” The evaluation committee was impressed, and Ruf was named the 2023 recipient of the fellowship, which includes unrestricted funding of US\$50,000.

Ruf will use that funding to bring optics teaching materials directly into the 2HNet effort; to test the effectiveness of specific materials in different settings; and to supplement those materials with resources such as training manuals and videos. In Liberia, he stresses, “small things can have a big impact.”

The need to dream big

Ruf’s experience in Liberia thus far has sharpened his perception of his own good fortune and privilege and his desire to build a more equitable world. 2HNet is, of course, only one small venture in Liberia—a country that, Ruf admits, faces particular hurdles given the persistent legacy of its long civil war. Building education and human capital is, he says, “a huge task in many places in Africa.” And while 2HNet has already boosted the training of scores of teachers, scaling up its effort will be a heavy lift.

Even so, Ruf stresses that he and the 2HNet team are not in this alone: “When you start something and talk about it, you get support and you find others who have a similar mission.” He encourages anyone who might be interested to get in touch with him or the organization to learn more. “To me, it’s important to tell anyone who feels motivated in supporting this in any way—don’t hesitate.” He adds that 2HNet also partners with another Liberian nonprofit, the Center for Science Education, as well as the University of Liberia, to carry the impact higher in the education sector.

“It will take time, and no one said it will be easy or fast,” Ruf acknowledges. Yet he also cites the words of former Liberian President Ellen Johnson Sirleaf, the first democratically elected woman head of state in Africa, who shared the 2011 Nobel Peace Prize with two others for their efforts promoting peace-building and women’s rights. “If your dreams do not scare you,” Sirleaf wrote, “they are not big enough.” **OPN**

Stewart Wills is OPN’s senior editor.

For information on the Helping Hands Network, visit 2hnet.org. For more on the Chang Pivoting Fellowship, see optica.org/pivoting.