Blum Center for Developing Economies
University of California, Berkeley
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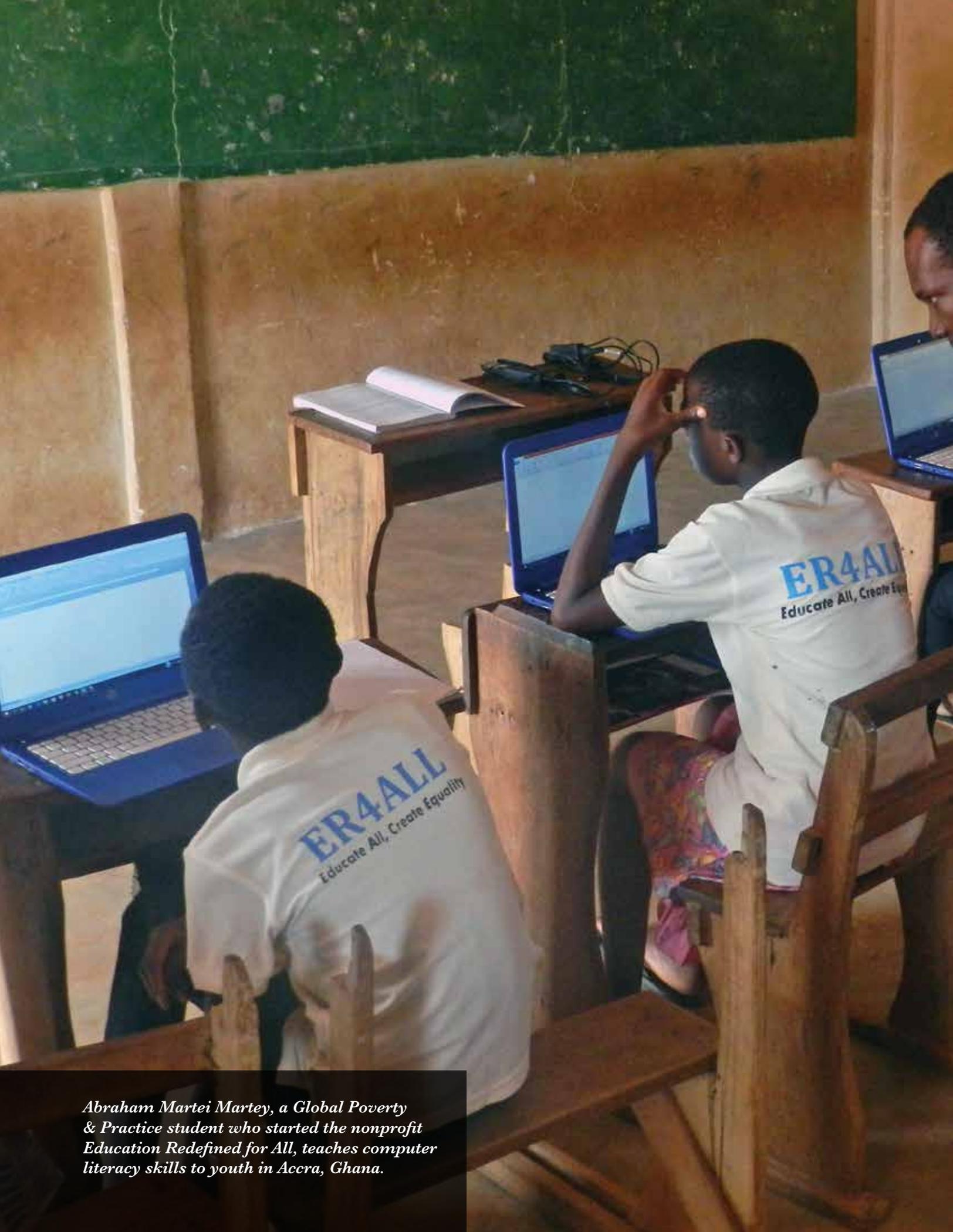
Abraham Martei Martey, a Global Poverty & Practice student who started the nonprofit Education Redefined for All, teaches computer literacy skills to youth in Accra, Ghana.

The Blum Center for Developing Economies leverages the talent, enthusiasm, and energy of the UC Berkeley community to address the grand challenge of global poverty.

Our interdisciplinary problem-solving approach draws on students and faculty dedicated to facing this challenge through innovative initiatives, education, and research.

Back to the Roots, a Big Ideas project, brings sustainable grow-at-home and ready-to-eat products into households.

CONTENTS

A Year of Solutions Science and Scholarship at the Blum Center

What is the role of the university in the wider world? What is the role of scholarship in an era of vast digitally enabled knowledge?

These are two questions we at the Blum Center keep forefront in our minds, as we pursue forward-looking curricula and solutions scholarship related to global development. During the 2018-2019 academic year, we focused on three areas:

1) Interdisciplinary faculty research

2) Students tackling global societal problems

3) Development Engineering

The faculty salon series included scholars from across campus, including Professors Michael Nacht (Public Policy), Brad DeLong (Economics) Ken Goldberg (Robotics), Laura Tyson (Business), Daniel Fletcher (Bioengineering), Joshua Blumenstock (Information), Moritz Hardt (Electrical Engineering and Computer

Sciences) Isha Ray (Energy & Resources), Alison Post (Political Science), Edward Miguel (Economics), Catherine Wolfram (Business), Daniel Kammen (Energy), and Solomon Hsiang (Public Policy).

The discussions were wide-ranging, covering: the effects of automation and machine learning on employment across nations and economies; health information gaps in the detection and treatment of neglected tropical diseases; the application of machine learning to monitor and alleviate poverty; rural electrification impediments in Kenya; and the promise of renewable energy for low-income communities in California and across the world.

The 2018-2019 academic year was also marked by great successes for Blum Center student teams

field integrates engineering, economics, business, natural resource development, and social sciences to develop, implement, and evaluate new technological interventions that address the needs of low-income communities around the world. Engineering was created as an applied science; Development Engineering takes the field a step further by broadening the potential applications of engineering to address 21st-century inequities.

Because such skill sets are in high demand, in 2021 the Blum Center aims to launch a masters' degree in Development Engineering. This professional program will bring together our undergraduate Global Poverty & Practice minor and our PhD-level designated emphasis in Development Engineering. It will also continue to fulfill an aspiration articulated by Blum Center Board Member and former Secretary of State George Shultz, who said:

> *"Economists believe the best way to deal with poverty is to create prosperity, and that works, but not everywhere. Engineers, by contrast, like to invent things that might help. At the Blum Center, we're putting them together; it's a different approach."*

Please enjoy this annual report, which fleshes out the efforts described above. And please be in touch with us about your thoughts and ideas for global social and economic prosperity.

Shankar Sastry
Faculty Director of the Blum Center and UC Berkeley Professor of Electrical Engineering, Computer Science, and Bioengineering

Shankar Sastry

working in social innovation and enterprise. Bolt Threads, which got its start from the Big Ideas Contest, grabbed headlines for its next generation performance fibers and fabrics, attracting a total of $213 million in funding. DOST, which builds software, audio content, and toolkits for low literacy parents to boost their children's early development, continued to scale in India and received hard-to-win support from Y Combinator. Respira Labs, which is developing the first wearable device to measure air trapping related to chronic obstructive pulmonary disease, racked up awards and funding, including a Small Business Innovation Research Program Phase 1 grant from the National Science Foundation. These are just three of many examples.

We also placed our energies in the expansion of Development Engineering. Development Engineering is an interdisciplinary field to address the challenges posed by the United Nations Millennial and Sustainable Development Goals. The

Educating to Understand and Engage in Complex Societal Problems

Today's globalized world is filled with complex problems to which there are no obvious solutions.

Problems such as securing access to food in an era of climate change, providing universal housing amidst rapid urbanization, and determining ways to provide consumers with low-carbon energy all require innovative thinking and action if progress is to be made.

As the late Paul Polak, a leader in social entrepreneurship, argued: over 90 percent of the world's design efforts are aimed at 10 percent of the population. The people who need game-changing solutions are not engaged within the innovation process, while significant resources are being spent on solving the wrong problems, or more precisely, developing products and processes that make money but improve the world for only a small number of people.

Perhaps the biggest driver for Blum Center's education program is meeting the Sustainable Development Goals. The "SDGs" are a collection of 17 global goals set by the United Nations General Assembly in 2015 for the year 2030. They are:

1) **No Poverty**
2) **Zero Hunger**
3) **Good Health and Well-being**
4) **Quality Education**
5) **Gender Equality**
6) **Clean Water and Sanitation**
7) **Affordable and Clean Energy**
8) **Decent Work and Economic Growth**
9) **Industry, Innovation, and Infrastructure**
10) **Reducing Inequality**
11) **Sustainable Cities and Communities**
12) **Responsible Consumption and Production**
13) **Climate Action**
14) **Life Below Water**
15) **Life On Land**
16) **Peace, Justice, and Strong Institutions**
17) **Partnerships for the Goals**

The goals are broad based and interdependent, and each have a list of targets that are measured with indicators.

Students, faculty, and researchers at the Blum Center are being motivated and driven by these goals. Our educational programs — the Global Poverty & Practice undergraduate minor, the Development Engineering graduate designated emphasis, the InFEWS (Innovations at the Nexus of Food, Energy, and Water Systems) fellowships, and interdisciplinary complex problem solving courses — are built around the idea that creating sustainable systems requires cross-disciplinary understanding; that no one person or approach can solve wicked problems; and that a combination of teamwork, humility, and hardwork, along with constant iteration and improvement, is always needed.

In 2018-2019, the Global Poverty & Practice (GPP) program continued its 12-year tradition of enabling undergraduate students to engage in a six-week practice experience. These students took on urgent issues. Leila Berkovitz, a geography major, was one of four GPP students who traveled to Greece to support the housing and well-being of refugees at the City Plaza Refugee Accommodation and Solidarity Space

Our educational programs are built around the idea that creating sustainable systems requires interdisciplinary understanding; that a combination of teamwork, humility, and hard work, along with constant iteration and improvement, is always needed.

in Athens. My Nguyen, a public health major, volunteered as a community health advocate at Asian Health Services in the Chinatown Oakland community, helping organize nail salon workers to advocate for their rights.

This year was also a strong one for our graduate students. Five Development Engineering and InFEWS students, with their teams, won prizes in the Big Ideas competition. These included: Trash to Tiles, a project to transform plastic waste into affordable and durable roof tiles; Visualize, a device that facilitates screening for cervical cancer; and ACAIE, a system for removing arsenic from groundwater in rural California.

Complex problem analysis courses have been central to the Blum Center pedagogy and, in 2018-2019, were applied in two ways. First, the center supported the Spring 2019 course Hacking4Local, to enable student teams to focus on socio-economic and infrastructure

Alice Merner Agogino

issues in Oakland. Second, throughout the year we conducted programs for the U.S. Air Force, Marines, and the Army on challenges at the intersection of national security and global development.

As a UC Berkeley faculty member who has taught in a dozen departments and schools and who has seen the fruits of this kind of interdisciplinary approach, I am proud to serve as the Blum Center's education director. Please read more about our efforts in the following pages.

Alice Merner Agogino
Roscoe and Elizabeth Hughes Professor of Mechanical Engineering

Product Design Concentration Founder and Head Advisor, MEng Program

Chair, Development Engineering Graduate Group

Education Director, Blum Center for Developing Economies

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What can be done to sustain global middle class progress in Asia?

Great Leaps in and Grand Challenges for Poverty Reduction

Are we in a watershed moment for global poverty reduction?

Two thousand and eighteen was the year — according to two major analyses — that more than half of the world's population moved into the "middle class." And it was marked by a billion people moving out of "extreme poverty" between 2000 and 2018.

Homi Kharas with the World Data Lab and the Brookings Institute defines the new global middle class as households that spend $11 to $100 per day per person. Kharas acknowledges this definition is imprecise, but is a way to understand the ability for 3.8 billion people to buy consumer goods, go to the movies, or take a vacation — and weather economic shocks like short-term illness or unemployment without falling into extreme poverty.

It is true the global middle class is largely a Chinese and Indian phenomenon; however, growth there is expected to be remarkable. Middle class markets in China and India will grow to 5.3 billion people by 2030 and will account for $14.1 trillion and $12.3 trillion, respectively, comparable in size to a U.S. middle-class market at that time of $15.9 trillion.

This is an amazing turn of events, though it does not mean that poverty is "solved." Indeed, the other big global demographic story of the year concerns the concentration of extreme poverty in Sub-Saharan Africa. By 2050, that region is where 86 percent of the world's extremely poor are projected to live, with more than 40 percent living in the DRC and Nigeria.

As the Blum Center mulls this, we are asking: **What can be done to sustain global middle class progress in Asia and enable economic and technological development in Sub-Saharan Africa? How best can we train the next generation of leaders in equality, innovation, and global problem solving? And what are the areas where we should make our big bets?**

As you'll see from this report, we are placing our bets on the next generation of poverty activists and scholars who can work collaboratively across disciplines and geographies. I am placing one of my big bets on the graduates of the Global Poverty & Practice minor, a founding program of the Blum Center that allows undergraduates from any major to examine poverty, wealth, and inequality.

Richard Blum

Today more than 300 students are enrolled in the minor each year, and over 19,000 students have enrolled in Global Poverty & Practice courses. Our students have completed practice experiences in over 70 countries, including supporting refugees in Greece and working toward eliminating homelessness in the Bay Area. They have gone on to jobs at the USAID Office of U.S. Foreign Disaster Assistance, the One Acre Fund in Rwanda, the World Wide Fund for Nature in Myanmar, the United Nations Development Programme, and the World Bank. Please read about them and our other efforts in the following pages.

Sincerely,
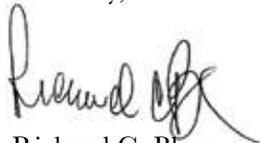
Richard C. Blum
Founder, Blum Center for Developing Economies
Chairman, Blum Capital Partners

Big Ideas Contest

A model for student innovators at the University of California and around the world

For years, I have witnessed the value of giving students the autonomy and mentorship they need to advance their nascent ideas — and I have become convinced that what we're doing at UC Berkeley, thanks to the generosity of the Rudd Family Foundation, can be a model for empowering student innovators around the world.

An example: In 2007, Big Ideas awarded $500 to students in my undergraduate bioengineering class to test the idea that a camera in a cell phone could be used for low cost microscopy. Fast forward to today — we and our collaborators have proved in the *New England Journal of Medicine* that LoaScope, as one of our mobile phone microscopes is called, can accurately identify parasitic worms in blood to facilitate mass drug administration for a Neglected Tropical Disease in Cameroon.

The CellScope project, which we call our broader effort to harness mobile phone microscopy to increase access to quality healthcare, is merely one example of what is possible through the Big Ideas program. Universities traditionally host business plan competitions, sponsor courses to help students launch companies, and house incubators and accelerators. While there are students in Big Ideas whose projects are of interest to traditional venture capitalists, the contest is more focused on enabling ideas for social impact.

Daniel Fletcher

Founded in 2006, Big Ideas provides seed funding and mentorship to interdisciplinary teams of students who are creating solutions to pressing social challenges. The premise is that students have important and innovative ideas — and that with mentoring, skills development, validation of their ideas, and a little seed funding — they are capable of great things.

To date, over 7,000 students have participated, from over 100 different majors, collaborating on 2,400 proposals. Big Ideas has awarded $2.6 million in prizes across more than 500 winning teams. These teams have used this modest seed funding — and the targeted mentorship provided by a network of over 1,500 plus judges, mentors, and sponsors —to collectively secure over $662 million in additional investment. These social ventures include for-profit enterprises, nonprofit organizations, hybrid entities, and community-based initiatives.

Big Ideas winners are having remarkable impact, as the following pages show.
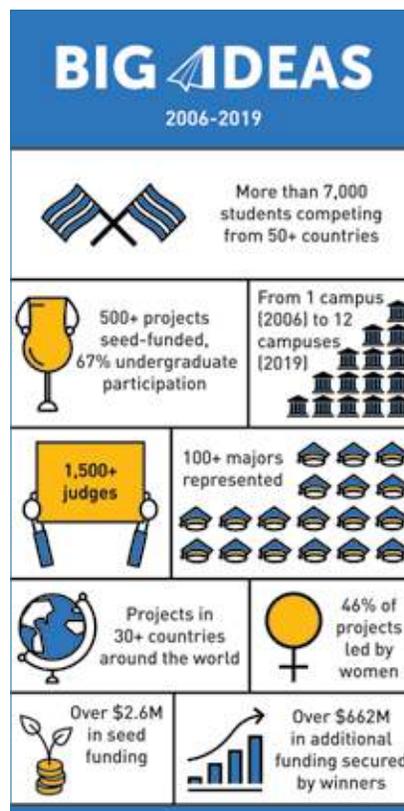
Daniel Fletcher
Purnendu Chatterjee Chair in Engineering Biological Systems, Department of Bioengineering

Faculty Scientist, Lawrence Berkeley National Laboratory

Chief Technologist, Blum Center for Developing Economies

Faculty Director, Big Ideas

BIG IDEAS
2006-2019

More than 7,000 students competing from 50+ countries

500+ projects seed-funded, 67% undergraduate participation

From 1 campus (2006) to 12 campuses (2019)

1,500+ judges

100+ majors represented

Projects in 30+ countries around the world

46% of projects led by women

Over $2.6M in seed funding

Over $662M in additional funding secured by winners

Big Ideas Getting Bigger

Not every project supported and seeded by the Big Ideas Contest goes on to become a viable nonprofit, for-profit, or hybrid. But many do. Since 2006, Big Ideas has emerged as a catalyst for University of California innovators — often the first step in conceptualizing, testing, funding, and implementing a groundbreaking idea.

Bolt Threads, a biomaterials company that has invented an environmentally sustainable lab-grown "spider" silk, received $213 million in funding and is valued at $700 million.

Vidado (formerly Captricity), an AI platform designed to help enterprise businesses extract and digitize otherwise inaccessible data, secured $51.9 million from six investors.

We Care Solar, which reduces maternal mortality by providing health workers with reliable lighting and mobile communication using solar electricity, operates across 34 countries in nearly 4,000 health centers.

Ricult, an agricultural digital solutions platform for the productivity and profitability of smallholder farmers in Pakistan and Thailand, received seed funding of $2.5 million.
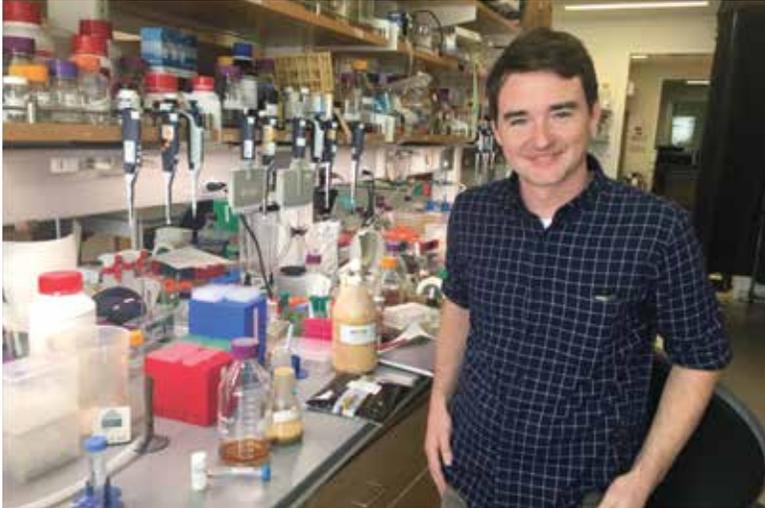
ZestBio, which harnesses the power of biology to upgrade agricultural wastes into specialty chemicals, received a National Science Foundation Small Business Innovation Research and Small Business Technology Transfer grant of $225,000.

Copia, which matches businesses with surplus food to those in need, has redistributed more than 1 million pounds of food, delivering 900,000 meals.

MarHub, which is building a migration management platform to enhance the way refugees and migrants access information and services and how organizations and governments provide them, is serving 3,000 refugees, largely from Syria and Iraq.

Codi (formerly Hiven), an online platform that connects freelancers looking for office space and apartment renters looking for additional funds, received seed funding from F7 and is set to launch in the Bay Area 2020.

Respira Labs, which is building the first AI-powered platform that can predict chronic obstructive pulmonary disease exacerbations via acoustic resonance, received $305,000 in seed funding from Berkeley Skydeck and a $225,000 National Science Foundation Small Business Innovation Research and Small Business Technology Transfer grant.

Development Impact Lab

The Development Impact Lab, seeded by the U.S. Agency for International Development, invests in innovators who are prototyping, scaling, and evaluating technologies for low-resource settings.

In 2019, mentored by professionals from the Big Ideas network, students at Makerere University in Kampala, Uganda advanced projects in health technology, agricultural financing, and disease prevention.

PedalTap prevents disease transmission and saves water through its hands-free, foot-operated water dispensing device. Winner of the Johnson & Johnson Africa Innovation Award, PedalTap began piloting its device at Uganda's National Referral Hospital and in Uganda public schools, toilets, and offices in March 2018.

m-Omulimisa is an agriculture technology company that leverages ICT tools to improve the livelihoods of smallholder farmers in Uganda. Over 13,000 farmers have been registered on the m-Omulimisa platform and secured partnerships with the Agricultural Innovation Systems Brokerage and the Slow Food network in Uganda.

Mama-Ope is scaling a biomedical "smart jacket" for diagnosis and continuous monitoring of pneumonia patients under age 5. Mama-Ope was featured on BBC, shortlisted for the Royal Academy of Engineering Africa Prize, and received $25,000 from early-stage incubator Villgro Kenya.

The LoaScope accurately identifies parasitic worms in blood to facilitate mass drug administration for a Neglected Tropical Disease in Cameroon.

In 2019, the **CellScope project**, such as the LoaScope and other mobile phone-based microscopes, began to expand the diagnostic capabilities of the technology to include other diseases including Schistosomiasis (also known as snail fever). In 2020, Blum Center Chief Technologist Dan Fletcher and collaborators will test the new device — called the SchistoScope — in the Ivory Coast.

Left: A CellScope in use for educational activities by Kahi Kai in Hawaii.

Global Poverty & Practice Minor

*Celebrating 12 years with over 17,000 students*

Established in the Fall of 2007, the Global Poverty & Practice (GPP) Minor — one of the largest and most popular minors on campus — gives students an opportunity to examine contemporary forms of poverty, wealth, and inequality through academic coursework and practical experience.

Through GPP, students from across academic disciplines come together to think critically about issues of poverty and inequality, and investigate the ways in which the minor can supplement their major field of study. To date, 17,550 students have taken GPP courses and 910 have graduated from the minor.

Robert Reich, Chancellor's Professor of Public Policy and a Senior Fellow at the Blum Center, lectures about inequality in a popular GPP class.

Central to the minor is a six-week fieldwork opportunity — the Practice Experience — in which students connect theory with action by partnering with nongovernmental or community organizations, government agencies, or other development programs domestically or abroad. The Blum Center offers funding support for students' Practice Experiences through a competitive fellowship.

Students graduating with a minor in Global Poverty & Practice become versant in the following:

• Scholarly approaches to understanding poverty, wealth, and inequality in an historical and global context.

• Knowledge of international development and domestic poverty alleviation policies, programs, institutions, and social movements.

• An ability to critically engage in public debates about poverty and poverty action through written texts as well as through the use of social, digital, and visual media.

• Knowledge of the history and contemporary politics of poverty and inequality in a particular place or world region, in preparation for the practice requirement of the minor.

• Analytical and practical skills gained through the Practice Experience in a particular sector of poverty action (e.g., agricultural and rural development, urban poverty, public health, human rights, legal systems, education, energy resources, and sustainable technology), at various scales (e.g., community, global) and in various forms (e.g., government policy, social movements).

• An understanding of different modalities and relations of power involved in poverty action, developed through historically informed analytical skills, the Practice Experience, and critical reflection.

Students take on skills building and educational training, from Oakland to Argentina.

GPP Practice Experiences

Practice Experiences took UC Berkeley students around the globe.

Pallavi Panyam

Major: Civil Engineering
Minor: Global Poverty & Practice
Practice Experience: Women's Housing Cooperative, Mahila Housing Trust in Ahmedabad, India

At the Mahila Housing Trust, Pallavi was introduced to policy research, analysis, and fieldwork, which led her to writing a policy brief for the Indian government. She said that using analyses and field work to create policy "is the space I want to work in, whether with this specific organization or domestically. I got lucky because I want to stick with this after graduation."

Ian Bertrando

Major: Philosophy and Legal Studies
Minor: Global Poverty & Practice
Practice Experience: Coalition on Homelessness in San Francisco

Most of the Coalition's employees have experienced homelessness, with the result, said Ian, "that they're able to relate to the people they are advocating for and develop strategies to push the movement forward." For the Coalition, Ian worked on community outreach, political campaigning, and community planning meetings. "Though draining and exhausting at times," said Ian, "the work is very rewarding and something I can see myself doing for the rest of my life."

Chris Guerrero

Major: Social Welfare
Minor: Global Poverty & Practice
Practice Experience: Peoples Solidarity and Education Tours, Philippines

Peoples Solidarity and Education Tours works to expose visitors to the real conditions of local and indigenous communities in the Philippines. Chris worked in media activism; he put together videos, and facilitated art, music, and dance programs for urban poor communities. A Filipino-born American, Chris said, "I wanted to use this opportunity to see the disparity between my own experience as a Filipino American versus those living in the Philippines, and continue to be a bridge between the two homes that I currently have."

Bori Kozek

Major: Environmental Sciences
Minor: Global Poverty & Practice
Practice Experience: Fundación Suyusama, Colombia

During her practice experience in Colombia, Bori learned about Fundación Suyusama's farmer empowerment initiatives — small scale irrigation, protecting micro watersheds, regrowing or reforesting farms, and helping to increase coffee quality. She said, "So often we have external organizations coming and dictating what should be done in the global South; I went to learn about how we can organize things differently and bring that inspiration back here. I went with the motivation to be more inspired, and I was."

Global Poverty & Practice Alumni

Alumni of the program are working in practically every facet of development.

Benjamin Hans '10

After graduating from Cal with a BS in Industrial Engineering and Operational Research and a minor in Global Poverty & Practice, Benjamin Hans moved to a small town in Rwanda to work for the One Acre Fund. The East African social enterprise supports small farmers with financing for farm inputs, agricultural training, and resources such as seed fertilizer and market facilitation. Benjamin started off as One Acre's product engineer and by 2016 became director of product development. "Our company is giving people the opportunity to get out of situations that constrain them, so that during the hunger season there is enough food on the table and their kids can go to school," said Benjamin. "With additional profits, they also can invest in more capital like livestock and land to further extend their income."

Kaya Allan Sugerman '12

Kaya Allan Sugerman graduated magna cum laude with a major in International and Area Studies and a minor in Global Poverty & Practice. In 2012, she worked at the University of Malaya in Malaysia as a policy research assistant on a biodiversity report highlighting mechanisms for meaningful political representation among largely indigenous communities. In 2014, Kaya moved to Colombia to work as a human rights accompanier for marginalized community groups and human rights advocates, including La Comunidad de Paz de San José de Apartadó. Human rights accompaniment is a preventative tactic to diminish violence by having international volunteers physically present alongside threatened communities. In this capacity, Kaya served as a member of the Fellowship of Reconciliation Peace Presence to provide "physical safety, political visibility, and solidarity by accompanying communities and organizations that embrace active non-violence to defend life, land, and dignity." Kaya is currently the public interest litigation coordinator at the Center for Environmental Health in Oakland, California.

Sergio Venegas Marin '12

Since earning a BA in Economics and a minor in Global Poverty & Practice, Sergio Venegas Marin has worked at the intersection of social protection, education, and labor. After graduation, he joined Mission Analytics Group, a government consulting firm based in the San Francisco Bay Area, where he focused on "the quantitative analysis of public policies related to issues of child care, child welfare, services at risk youth, health care access and reform, and services for people with disabilities." In 2017, Sergio earned a Master in Public Affairs at Princeton University, after which he worked as a consultant on education policy for the World Bank Group. In his early days at the World Bank, Sergio quantitatively measured quality of education in Pakistan and Tanzania, helped the government of Uruguay identify service delivery problems among teaching staff, and contributed to the development of an open-source classroom observation tool. He recently focused on the development of a multidimensional dashboard to operationalize the 2018 World Development Report and complement the Human Capital Project to address the learning crisis globally.

Areidy Beltran '14

Areidy Beltran is the first in her family to graduate from a top tier university and is fluent in four languages. A triple bear, Areidy earned a BA in Environmental Earth Science, a minor in Global Poverty & Practice, and an MA in Earth and Planetary Science Policy and Management. She won a UCOP Carbon Neutrality Initiative Fellowship, a National Hispanic Scholarship, a UC Berkeley Graduate Opportunity Program Master's Fellowship, an Educational Opportunity Program Achievement Award, a U.S. Department of State Critical Language Scholarship, Benjamin A. Gilman Scholarship, and a Charles H. Ramsden Endowed Scholarship. Areidy has served as a Global Poverty & Practice peer advisor and is both an InFEWS (Innovations at the Nexus of Food, Energy, and Water Systems) Fellow and a Development Engineering PhD student. Her passion is analyzing the impacts of climate change, and she "aims to develop holistic strategies to increase the resiliency of our global food, water, and energy systems in both developed and developing regions."

Imagining the Future Helps Us Engineer Toward that Future

Development Engineer William Tarpeh

For years, William Tarpeh didn't know if it was possible to be a research engineer who works in the developing world. His interest started in high school, when he learned that more than 2 billion people lack access to adequate sanitation. And it expanded throughout college, as he studied chemical engineering and African studies and interned at Sarar Transformación, a Mexican nonprofit focused on sanitation. "That's when I got interested in ecological sanitation," he said, "which is just the idea of using waste as fertilizer." Tarpeh, now an assistant professor in chemical engineering at Stanford, says his professional turning point happened in 2013, the year the Development Engineering program started.

William Tarpeh

How did Development Engineering shape your academic work in global sanitation?

It was extreme serendipity. Development Engineering started the year I got to Berkeley and made a lot of things possible. It gave me a formal structure — having a chapter in my dissertation that was explicitly about Development Engineering and about my sanitation work in Kenya. If it weren't there and if I hadn't gone to Berkeley, I might not have explored this part of my academic identity in as much detail. Now it's such a crucial part, I can't imagine being an academic without it.

What else drew you to Cal?

I wanted to work with Civil and Environmental Engineering Professor Kara Nelson, because she has a process engineering focus for achieving sanitation goals. She had a Gates Foundation grant that was part of the Grand Challenges exploration, and she and a post-doc were working on the idea of using ammonia from urine to disinfect feces. I tagged along and went to the Gates Foundation's Reinvent the Toilet Expo. I got to see all these cool toilets and realized there was a large community of academic researchers who shared my interests.

How did your research develop?

My first year in graduate school I reviewed journal papers and focused on unanswered questions. That's when we landed on urine and recovering nitrogen. We chose urine because there were lots of motivations for separating out urine and feces. And from a chemical engineering perspective, we thought nitrogen from urine could be useful because nitrogen fertilizers are central to modern society — they've helped feed a growing population. We focused on what we could borrow from other subfields, such as the extraction of nitrogen from wastewater in the U.S., and also on what we could dream up on our own to address sanitation access.

How do you see your academic contributions?

My first paper as a PhD student compared materials that adsorb or concentrate nitrogen in urine. We compared four different adsorbents. Then we took the work to the field and published it in the *Development Engineering* journal — which meant characterizing the technology in lab, bringing it to the field, and in between looking at the operating and design parameters to show the trajectory as a contribution. Another contribution is in electrochemical nitrogen recovery. Electrochemistry and wastewater treatment have met in earnest over the past decade or so. I am part of the first group of people to apply electrochemistry to urine and to extract nitrogen in a new way we call electrochemical stripping. It's set

Tarpeh's Kenya-based research is focused on transforming waste into fertilizer.

some records in terms of nitrogen recovery efficiency and resulting energy efficiency.

You said in a previous interview that "a lot of the solutions to the world's most pressing problems are in the minds of children who are simply preoccupied with survival." Why are children a place to understand the world's grand challenges?

Grand Challenges are really interesting because they are descriptive in nature. Through them, academics, UN representatives, and others try to describe a reality that millions of people experience. But I think the expertise really lies in the communities who experience the problems. We as scientists can try to lend our technical expertise in other communities — but the people who live in those communities are the real experts. That's how I approach my work. This comes in part from growing up in a low-income household in the U.S., and knowing that resource-constrained communities have valuable skills and life experiences to solve their own problems.

How new is the field of Development Engineering?

It's not new in some ways. People have been doing this kind of engineering for as long as there's been inequality. What's new is that we're studying how we do it and thinking about better ways to do it. Ten years ago, it was news to people that you need to engage the community when you design for it. It really was. We would learn about implementation failures all the time — and be surprised that engineers didn't remember to ask people about their sanitation needs and, as a result, the new toilets got turned into closets because they had roofs. Now, I see the frequency with which that kind of thing is reported going down, which tells me there's value in the Development Engineering enterprise. It formalizes things in a way that engineers who don't focus on development can appreciate.

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Interdisciplinary Complex Problems

Working collaboratively for iterative problem identification and solution formation

"The more I learn, the more I realize how much I don't know" is an adage that has been attributed to Albert Einstein. These words resonate not just because they are Einstein's but because complexity of knowledge is a hallmark of the 21st century.

Across the world, people are focusing on how to best identify "what we don't know" through problem analysis approaches and through collaborative teams that create disruptive inventions. Many of these disruptions have taken place in the technology sector, where economies of scale and new ways to access markets have transformed industries.

At the Blum Center, we believe these approaches, modified and contextualized, can have just as powerful applications to societal issues — to inventions for wicked problems at the intersections of peace and security; food, water, and energy; and health and employment. Central to this approach is a belief in the power of interdisciplinary teams and training for iterative problem identification and solution formulation. It is an approach that combines the solutions-oriented rigor of engineering with the critical thinking perspectives of history, economics, public policy, and behavioral psychology.

During the 2018-2019 academic year, our complex problem analysis methods were applied in two ways. First, the Blum Center supported the Spring 2019 course Hacking4Local, to enable student teams to address problems for local stakeholders working on socio-economic and infrastructure issues in Oakland, Berkeley, and San Francisco. They included fire risk in the Berkeley-Oakland Hills, health disparities in South Berkeley, and community engagement in affordable housing.

With a flipped classroom format, there were no lectures in class. Students used frameworks such as the mission model canvas, customer discovery, and systems mapping to conduct interviews and do field research with the local groups. They presented ideas and insights in class and refined them with guidance from five interdisciplinary professors and lecturers.

The second way the Blum Center furthered its interdisciplinary problem solving efforts was through educational workshops for the U.S. military. Blum Center lecturers traveled across the U.S. to work with the Air University, the 4th Fighter Wing, and 673rd Air Base Wing on challenges of national security and global development. They worked with multiple ranks who investigated challenge areas using Blum Center methodologies.

Blum Center Researcher and Lecturer Rachel Dzombak specializes in interdisciplinary problem solving.

InFEWS Fellows Take on Sustainable Development Goals

Training engineers to alleviate poverty in the world's low-resource regions

Since 2017, the Blum Center has enabled graduate students to develop societal benefit research through the InFEWS — Innovations at the Nexus of Food, Energy, and Water Systems — program funded by the National Science Foundation. InFEWS provides fellowships and travel stipends for students whose PhD research aims to provide lasting environmental solutions and alleviate poverty in the world's low-resource regions.

This year's cohort of InFEWS Fellows includes 37 students from 13 schools and departments at UC Berkeley. **Sixty five percent of the fellows are women and 25 percent are under-represented minorities.**

Sara Glade

Sara Glade is a PhD student in Environmental Engineering whose InFEWS work focuses on drinking water treatment technology development and implementation.

"My exposure to Development Engineering began during my undergraduate career when I was introduced to Engineers Without Borders. My passion for water came to fruition in the field in Haiti, after seeing children walk miles to collect polluted water. There, I learned the potential of engineering and water to improve the quality of people's lives, which inevitably drew me to researching water treatment technologies for disadvantaged regions.

At UC Berkeley, I have learned firsthand the challenges American communities face with drinking water contamination. I am adapting in Allensworth, in the California Central Valley, a novel arsenic treatment technology called ElectroChemical Arsenic Remediation (ECAR) that was developed by my advisor, Civil and Environmental Engineering Professor Ashok Gadgil. This project is perfect for my interests in U.S. water treatment, technology development, and implementation."

George Moore

George Moore is a Mechanical Engineering and Development Engineering doctoral student whose InFEWS research focuses on food, energy, and water systems with the Pinoleville Pomo Nation of Northern California.

"My first opportunity to work on InFEWS-related research came during a University of Michigan research internship in 2015. I studied a sustainable manufacturing project for an underdeveloped community in Uganda. As someone who grew up a minority in the rural South, this project made me feel connected and empathetic toward underserved communities globally. I read several case studies where organizations or researchers engaged with communities in developing countries and the original plan of action had to be altered to accommodate for context and cultural values.

Over time, I have grown curious about the methods used to design for communities that precipitate not only tangible goods, but also sustainable practices related to the handling of primal needs like food, water, and energy resources. At UC Berkeley with my advisor, Mechanical Engineering Professor Alice Agogino, I have been working with the Pinoleville Pomo Nation (PPN) of northern California on a variety of educational projects. The PPN community is interested in STEAM (Science, Technology, Engineering, Art, and Math) education, and over the past year we have collaborated on an academic success center, a makerspace, and STEAM summer camps."

Lorenzo Rosa

Lorenzo Rosa is a PhD candidate in the Department of Environmental Science, Policy, and Management whose InFEWS research investigates where water scarcity may limit energy and food systems.

"I am developing a quantitative framework to make informed investment decisions involving natural assets that are susceptible to water risks. Limited understanding of the potential impacts of human activities on water resources prevents the implementation of a sound management plan for a sustainable human development. For example, we are depleting ecosystems in rivers because we are taking too much water from them. The classic example is the Colorado River. It runs dry and the water does not reach the ocean. The key is understanding where we can increase water production, because we know the population is going to reach 9.5 billion by 2050. We'll need to add 50 percent of current water production to feed all these people. And so we'll need to figure out where we can (and cannot) produce more food with water in a sustainable way. In other words, we'll need to move production where the water is or swap crops or use less water-intensive crops or transport water — so that we can increase food production for 2.8 billion people."

Big Ideas Research on Supporting Female Innovators

High-touch incubators can help level the playing field for women founders.

In the United States, female-led enterprises remain hard to find. A 2017 Crunchbase study reported that only 17 percent of startups have a female founder, a flat rate since 2012. The Kauffman Foundation reported in 2016 that women are half as likely to start a business as men. The numbers are even worse for women of color; Digital Undivided reported that less than 4 percent of women-founded businesses in 2017 had a black female founder.

The numbers around funding for female-led enterprises are equally bleak. In 2018, the Boston Consulting Group revealed companies founded or cofounded by women attracted an average $935,000 in venture capital investments, compared to $2.1 million for male-founded enterprises — despite the fact that women-led businesses generated 10 percent more in cumulative revenue over a five-year period.

> **BCG's sobering conclusion was: 1) startups cofounded by women are significantly better financial investments; and 2) the cards are stacked against women founders because of a range of biases.**

Yet a bright note in the report was about "accelerators"—organizations that fund and promote startups and give support to women founders. The advice was: "Accelerators and other organizations that promote startups have a significant role to play in closing the investment gap. They must start by making sure that they have a balanced slate of applicants, and to do this, they must actively recruit promising women entrepreneurs. Additionally, accelerators should ensure that they have sufficient numbers of women who are

experts across industries and can act as role models and mentors."

At the Blum Center, we agree with this advice because we have analyzed the transformational effect the Big Ideas Contest has had on women founders. Big Ideas' research team has found that the contest has been attracting more women founders — up to 52 percent of winners in 2017 from 36 percent in 2006 — and has funded 211 women-led startups since 2007. Specifically, the nature of the Big Ideas application process and its network of judges and mentors play pivotal roles in the success of women students.

In Big Ideas, there is a correlation between female participants' success and the number of female judges in the pool. In 2014, the 42 percent female judging pool awarded funds to student teams that were 40 percent led by women, despite the fact that women-led teams made up 46 percent of the total applicant pool. In 2018, a 52 percent female judging pool awarded funds to projects that were 52 percent led by women, who made up 41 percent of applications.

Big Ideas researchers also found that women mentors, who advise on project plans, offer much needed perspectives and networks and have a better understanding of some of the types of products and services that women are proposing. While Big Ideas female founders have proposed a wide variety of innovations that benefit a wide population, male mentors may be less familiar with the market opportunity for innovations such as a breastfeeding simulator (LiquidGold Concept, 2016 winner), a portable power source for maternity clinics (WE CARE Solar, 2008 winner), or eco-friendly sanitary pads for girls in rural Uganda (EcoSmart Pads, 2018 winner).

When Maria Artunduaga won a Big Ideas award in 2017 for her team's technology to manage pulmonary disease, she noted a critical factor in the victory: contest-organized mentorship from Jocelyn Brown of the Rice 360° Institute for Global Health.

"Her experience building health technologies for preterm babies in Africa was key to our success in the Big Ideas student innovation contest," Artunduaga said. "Jocelyn challenged me to learn more engineering, to think carefully about the right processes to transition medical devices from design to development, to clinical evaluation and distribution in a global health setting, which is completely different from the U.S." Artunduaga's enterprise, Respira Labs, recently received $305,000 in seed funding from Berkeley Skydeck and a $225,000 National Science Foundation Small Business Innovation Research and Small Business Technology Transfer grant.

Women mentors — especially those from low-income or minority backgrounds—also understand the importance of access and prior experience. Big Ideas data shows 37 percent of winning male team leads previously worked for a startup, versus 22 percent of women. For that reason, the contest provides a high-touch support system, annually providing more than 20 networking opportunities and workshops, three rounds of formal feedback from the wider network, and over 200 hours of advising. In the fall of 2017, at the start of the Big Ideas application process, 53 percent of women said they "are likely to start a social venture on their own or with others in the next 12 months," versus 68 percent of men. By the spring of 2018, 63 percent of women and 68 percent of men report this as their intention.

Further, at the time of application, more male entrepreneurs said they feel confident in developing a strong network to support their social venture than

In Big Ideas, there is a correlation between female participants' success and the number of female judges in the pool.

their female counterparts. However, by the end of the contest, this flipped — Big Ideas witnessed a larger proportion of women founders reporting high levels of confidence than men.

Big Ideas numbers represent a small and early-stage slice of the incubator and accelerator pie. But the Blum Center's data on female founders of nonprofits, for-profits, and social enterprises show that high-touch incubators can help level the playing field for women founders.

Tainted Garments: Exploitation of Women and Girls in India's Home-based Garment Sector

A new report addresses exploitative labor conditions.

The Blum Center report "Tainted Garments" by modern slavery expert and Blum Center Researcher Siddharth Kara offers the most comprehensive investigation to date into the conditions of work for women and girls in India's home-based garment sector. Kara found that approximately 85 percent of the home-based garment workers documented for the report work exclusively in supply chains of major apparel brands in the United States and European Union. These Indian workers consist almost entirely of women and girls from historically oppressed ethnic communities who earn approximately $0.15 per hour. The primary aim of the report is to provide insights into the lives of these workers in the hope that governments, companies, and nonprofits will be able to better coordinate on solutions to address the exploitation documented.

Kara's key findings include:

• Home-based garment workers in India consist almost entirely of women and girls from historically oppressed ethnic communities who earn approximately $0.15 per hour.

• 99.3% of the workers were either Muslims or belonged to a heavily subordinated community, called a "Scheduled Caste."

• 99.2% work in conditions of forced labor under Indian law, which means they do not receive the state-stipulated minimum wage.

• 95.5% of workers were female.
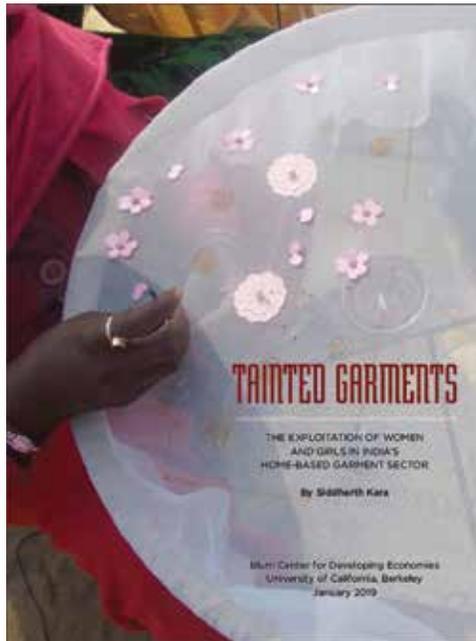
• Almost none of the workers received any sort of medical care when injured at work.

• None of the workers belonged to a trade union and none had a written work agreement.

"Tainted Garments" offers 10 recommendations to help address the exploitation of women and girls in India's home-based garment sector, including developing a high level public-private partnership focused on ensuring that labor exploitation and child labor are eliminated from India's garment sector, forming a home-based garment workers union, and increasing and enforcing minimum wages.

"In order to fundamentally transform fashion into a fair and sustainable industry, we need to have hard data and research that leads to evidence-based solutions. This study is the first ever attempt to analyze the details of conditions of women and girls in India's home-based garment sector in India and to find solutions for the problems. We believe that this research will inform the development of strong solutions that will address forced and child labour in the sector," said Anindit Roy-Chowdhury, labour rights programme manager of the C&A Foundation.

"Tainted Garments" received press from the *New York Times, Guardian, Reuters, South China Morning News, Quartz, India Times*, and other news outlets. Read the full report: https://blumcenter.berkeley.edu/publications/tainted-garments/

Faculty Salons

A yearlong conversation on the digital transformation of development

A faculty salon featuring Energy Professor Dan Kammen and Public Policy Professor Solomon Hsiang

A top priority of the UC Berkeley 2018 Strategic Plan is "inclusive intelligence," focused on the societal and ethical implications of artificial intelligence, robotics, and data sciences. As part of that effort, and in adherence to the Blum Center's mission is to alleviate poverty in low-income regions, the Center launched an interdisciplinary faculty salon in 2018-2018 to explore what we call the "digital transformation of development."

In November, **Robotics Professor Ken Goldberg and Business Professor and Blum Center Chair Laura Tyson** debated the effects of automation and machine learning on employment across nations and economies. Goldberg, who believes automation will both eliminate and create new jobs, proposed a "multiplicity movement" to foster uniquely human skills that AI and robots cannot replicate: creativity, curiosity, imagination, empathy, human communication, diversity, and innovation. He recommended the U.S. reinforce creative and

social skills in high schools and universities, so that Americans are in a position to leverage machines with varying levels of automation alongside diverse groups of people to amplify intelligence and spark problem solving.

Tyson pointed out that the substitution of intelligent machines for low-cost, low-productivity workers poses the greatest challenge in Africa, where by 2050 the youth population is estimated to increase by 50 percent to 945 million. She said we must focus our attention on how African countries will fare in global trade and global supply chains, when the availability of comparatively cheap labor is no longer a competitive advantage. She advocated that nations develop comprehensive educational and development strategies that support the livelihoods of their citizens — and that share the benefits of intelligent machines broadly.

In early 2019, the Blum Center welcomed **Joshua Blumenstock from the School of Information**

to the faculty salon. Blumenstock, director of the Data-Intensive Development Lab, cautioned that even though the application of machine learning to monitor and alleviate poverty has become a much discussed aspiration, new digital methods may serve more as a complement than a replacement to traditional approaches, especially in the area of economic assessment.

However, he did point out that satellite imagery is becoming a key source for development research because it reveals basic physical infrastructure and quality of life trends. In his own research, Blumenstock has shown that by leveraging machine learning to analyze satellite data, we can draw conclusions about certain aspects of the quality of life with nearly the same accuracy as traditional, multimillion-dollar field surveys.

Technological interventions are never clear cut. This was illustrated in the April Faculty Salon by **Professors Isha Ray of the Energy and Resources Group and Alison Post of the Political Science Department**. They shared their analysis of the effects of the UC Berkeley-incubated social enterprise NextDrop, which designed a mobile phone intervention to alert Indian households via text when to expect water supply. Ray and Post's two-year study found the SMS service failed to have its intended time-saving effect due to a combination of oversights by NextDrop in terms of water service provision, mobile phone ownership, and other information gaps.

"It is absolutely essential to understand the role of human intermediaries and how drastically the conditions and results of an intervention can change from one setting to the next," said Ray.

In May, the salon turned to Kenya's rural electrification efforts, studied by **Ted Miguel, Oxfam Professor of Environmental and Resource Economics, and Catherine Wolfram, Cora Jane Flood Professor of Business Administration**. Although Kenya has received massive foreign assistance to achieve universal energy access, the economic benefits of rural electrification

in the world's poorest places are not straightforward. Miguel and Wolfram's research team conducted a randomized control trial to study the effects of electricity connections in 150 Kenyan communities, and found no meaningful medium-run impacts on economic, health, and educational outcomes. The reason? Even when heavily subsidized, the cost of connecting was a significant burden for many households whose average annual cash earnings were $205. In addition, rural Kenyans had no money to buy time-saving, productivity-enhancing appliances like refrigerators or computers.

The last faculty salon of the academic year was led by **Dan Kammen, Distinguished Professor of Energy, and Solomon Hsiang, Chancellor's Professor of Public Policy**, who engaged in a wide ranging conversation on the economics, politics, and development impacts of climate change. Kammen has spent much of his two-decade career at UC Berkeley focusing on renewable energy research, with a focus on the role of developing economies. He underscored that in Kenya, which has a robust mobile money system, off-grid solar-generated energy is becoming the norm in many rural areas. This illustrates, he said, that around the globe — from California (which will reach its 2025 zero net carbon emission targets ahead of time) to Morocco (which is the only country meeting Paris climate accord goals) — solar, wind, and other renewable energy sources are proving to be implementable and economically viable.

The problem, of course, is that the transition away from fossil fuels to renewables is not happening quickly enough. However, Hsiang, whose Global Policy Laboratory researches what we need to know to design global policy, said public interest in climate change modeling has increased dramatically over the last two years and the conversation among governments is now how detrimental will be the social cost of global warming, particularly for Southern Hemisphere countries.

"This is where the role of information and academic research becomes economically powerful," he argued.

Blum Center Network: The Power of Eleven

Education, innovation, and technology in action around the world

> **As a public research university, we are uniquely positioned to look for innovative approaches to intractable issues like poverty. Blum Centers will accelerate university-wide research and education on one of the most difficult issues of our time.**
>
> — UC President Janet Napolitano

Blum Centers engaging in poverty research and action are active on every University of California campus.

- UC Davis Blum Center for Developing Economies
- UCLA Blum Center on Poverty and Health in Latin America
- UC San Diego Blum Cross-Border Initiative
- UC Merced Blum Center for Developing Economies
- UC Santa Cruz Blum Center on Poverty, Social Enterprise, and Participatory Governance
- UC Irvine Blum Center for Global Engagement
- UC Riverside Blum Poverty Initiative
- UC Santa Barbara Blum Center for Global Poverty Alleviation and Sustainable Development
- UCSF Blum Center
- Milken Innovation Center at the Jerusalem Institute, Hebrew University

In the News

Blum Center people and projects garnered honors, awards, and press.

Shaikh Mohammad Bin Zayed presents the Zayed Sustainability Prize for Health to Laura Stachel of We Care Solar.

Giving Fund (2018 Big Ideas winner) **CEO Samantha Penabad** was featured in the July 1, 2018 *Financial Times* as part of the phenomenon of students setting up enterprises while still in university.

InFEWS Fellow Alana Siegner published "Does Urban Agriculture Improve Food Security? Examining the Nexus of Food Access and Distribution of Urban Produced Foods in the United States: A Systematic Review" in the September 2018 issue of *Sustainability*.

William Tarpeh, a Development Engineering graduate and Assistant Professor of Chemical Engineering at Stanford, made *Forbes* magazine's "30 Under 30 Science" list for 2018 for his work in sanitation solutions.

Global Poverty & Practice graduate Samantha Lew, who serves as policy director of the **San Francisco Coalition on Homelessness**, was interviewed by the *New York Times* for an Oct. 18, 2018 article about San Francisco's recently passed Prop C, which imposes taxes on corporations to fund initiatives to help the homeless. Lew said the proposition was a "no-brainer" because the funding would provide housing.

Blum Center Researcher Siddharth Kara's investigation of human rights violations in the Democratic Republic of Congo involving the mining of cobalt, a critical element in lithium ion batteries that power cell phones, computers, and electric vehicles, was covered in the Oct. 26, 2018 *California Magazine*. Kara said, "Some of the mining sites near the Zambian border are controlled by armed guards," Kara said. "I don't think enslaved is too strong a term."

The Blum Center-incubated NGO **We Care Solar** won the 2019 **Zayed Sustainability Award for Health**, beating out 2,000 nonprofits. The $600,000 award will be used to advance the organization's international Light Every Birth campaign, working in partnership with Ministries of Health, NGOs, UN agencies, and donors to eliminate energy poverty in maternal health centers in countries with high rates of maternal-newborn mortality and low levels of electrification.

Blum Center Innovation Fellow Rachel Dzombak was awarded a 2019 Presidential Chair Fellows Curriculum Enrichment Grant with colleagues Sara Beckman, Lisa Wymore, and Angela Marino

Ashok Gadgil's arsenic removal technology enabled clean water distribution to Dhapdhapi High School students in West Bengal.

for their collaborative curriculum project exploring the underpinnings of discovery and learning and how they might be leveraged to create a variety of interdisciplinary experiences for undergraduate students.

Blum Center Affiliated Faculty Member **Ashok Gadgil** and his **Development Impact Lab -supported ECAR** (Electrochemical Arsenic Remediation) technology for removing arsenic contamination from drinking water was covered in a Dec. 12, 2018 ***Better India*** article, which noted that since 2016 Gadgil and a team of researchers "have operated an ECAR-based water treatment plant out of a government school at Dhapdhapi village in the South 24 Parganas district of West Bengal, delivering arsenic-free drinking water." The success of the effort could spread to six Indian states considered arsenic affected by the Central Ground Water Board.

Big Ideas Winners Sabrina Atienza and George Ramonov raised $1.7 million in seed capital in February 2019 for their startup **Valued**, whose mission is to provide companies with the AI-driven tools they need to stop inappropriate behavior, bias, bullying, and discrimination.

Development Engineering Professor David Zilberman won the **2019 Wolf Prize in Agriculture**. Wrote the Wolf Foundation: "Dr. Zilberman's career presents a unique mixture of theoretical work, applied research and extension, and he is a leading protagonist in debates over water policy, environmental and resource policy in agriculture and the bioeconomy."

Development Engineering Professor Ashok Gadgil and Gabriel Lobos, Big Ideas Winner, were covered in the April 4, 2019 ***Scientific American*** article "Zapping Lead Pipes with Electricity Could Make Them Safer for Drinking Water," which reported: "It will take time to replace lead pipes, and Lobo thinks the new technology might offer a temporary stopgap to reduce contamination."

Steph Speirs, co-founder of the 2017 **Big Ideas winner Solstice**, won both the **Impact Woman Entrepreneur of the Year Award and the Banana Republic No Boundaries Award of the Elle Impact Awards**. Solstice radically expands access to clean energy across the U.S. by providing community-based solar power to any type of household.

Fast Company reported May 3, 2019 on how the Blum Center's **Hacking for Local** course enabled students to learn what people need fixed in their city and find community-driven solutions. Hacking for Local also received coverage in the ***East Bay Times, San Jose Mercury News***, and ***ABC News***.

Funders

The Blum Center is grateful for the generous support of the following funders:

The **National Science Foundation** is a United States government agency that supports fundamental research and education in all the non-medical fields of science and engineering.

The Lemelson Foundation uses the power of invention to improve lives, by inspiring and enabling the next generation of inventors and invention-based enterprises.

The **Autodesk Foundation** provides support to grantees in architecture, engineering, product design and manufacturing, visual effects, gaming, and related fields that are creating solutions to environmental and social challenges.

USAID is the world's premier international development agency and a catalytic actor driving development results. USAID's work advances U.S. national security and economic prosperity, demonstrates American generosity, and promotes a path to recipient self-reliance and resilience.

Established in 1998, the **Rudd Family Foundation** focuses on giving for higher education and human services.

Our students have remarkable abilities and aspirations. With your generosity, their potential is limitless.

Ways to Give
For information on how to support education and innovation initiatives at the Blum Center, please contact Maryanne McCormick, Executive Director, 510.847.6851 or mmccormick@berkeley.edu.

To give online: blumcenter.berkeley.edu

Faculty

The Blum Center brings together scholars from two dozen schools, departments, and institutes at UC Berkeley.

Shankar Sastry
Faculty Director, Blum Center for Developing Economies
Thomas M. Siebel Professor in Computer Science
Professor of EECS, Bioengineering, and Mechanical Engineering

Alice Merner Agogino
Education Director, Blum Center for Developing Economies
Roscoe and Elizabeth Hughes Professor of Mechanical Engineering
Product Design Concentration Founder and Head Advisor, MEng Program
Chair, Development Engineering Graduate Group

Daniel Fletcher
Chief Technologist, Blum Center for Developing Economies
Purnendu Chatterjee Chair in Engineering Biological Systems, Department of Bioengineering
Faculty Scientist, Lawrence Berkeley National Laboratory
Deputy Division Director, Physical Biosciences Division, Lawrence Berkeley National Laboratory
Faculty Director, Big Ideas

J. Bradford DeLong
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Research Associate, National Bureau of Economic Research

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Assistant Professor of City and Regional Planning

Ruzena Bajcsy
Professor of Electrical Engineering and Computer Science

Sara Beckman
Teaching Professor, Haas School of Business

Joshua Blumenstock
Assistant Professor, School of Information

Clair Brown
Professor of Economics

Jenna Burrell
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John Canny
Professor of Electrical Engineering and Computer Science

Jack Colford
Professor of Epidemiology

Lia Fernald
Professor of Community Health Services

Ashok Gadgil
Professor of Civil & Environmental Engineering

Paul Gertler
Professor of Economics & Public Health

Ken Goldberg
Professor of Industrial Engineering & Operations Research

Paz Maria Gutierrez
Associate Professor of Architecture

Fatmir Haskaj
Lecturer, Global Poverty & Practice

Amy Herr
Professor of Bioengineering

Khalid Kadir
Lecturer, Global Poverty & Practice

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