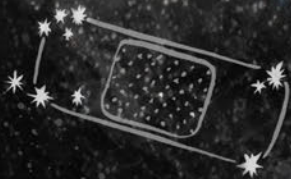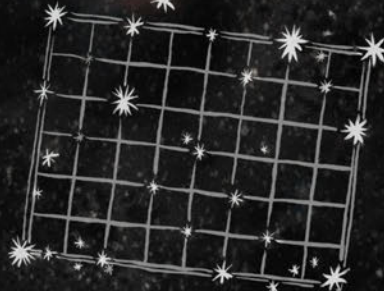# limn

NUMBER NINE

LITTLE DEVELOPMENT DEVICES AND HUMANITARIAN GOODS

LIMN NUMBER NINE **LITTLE DEVELOPMENT DEVICES & HUMANITARIAN GOODS**

Edited by Stephen J. Collier, Jamie Cross, Peter Redfield, and Alice Street

Preface

ISSUE 09

LITTLE DEVELOPMENT DEVICES & HUMANITARIAN GOODS

SMALL TECHNOLOGIES OF GOVERNMENT NOW permeate the field of international aid. From micro-insurance, sin taxes, and cash transfers to solar lanterns, water filtration systems, and sanitation devices, examples proliferate across the early 21st-century landscapes of humanitarianism and development. Some of these devices focus on fostering forms of social improvement. Others claim to alleviate suffering. Many seek to accomplish both, blurring the lines between public and private interests; between obligations, gifts and commodities; and between long-term improvement and short-term relief. *Limn* 9, "Little Development Devices/ Humanitarian Goods," examines the tremendous intellectual and moral energy, as well as the financial and organizational resources, being devoted to inventing and disseminating such micro-endeavors today. It asks: What does the proliferation of such small devices tell us about the contemporary state of "development" and "humanitarianism" as governmental projects, particularly when viewed in contrast to the massive modernist projects of previous decades? What forms of life, and what kinds of subjects, do they work on and constitute? What relationships do they establish between expertise, government, and the purported beneficiaries of these devices? What politics do they make possible—or preclude? And what might a critical social science have to say about them?

One can, of course, find antecedents for today's little governmental devices, for example, in the decentralized technologies of liberal government and the prepackaged instruments of emergency medicine of the late 19th and early 20th centuries, such as utility metering and first aid manuals, or in the do-it-yourself counterculture technology movement of the 1960s and '70s (Immerwahr 2015; Otter, 2007; Redfield, this issue; Turner 2006). As our title suggests, we perceive two trajectories into this phenomenon that distinguish its contemporary form and significance. The first derives from the legacy of the large, capital-intensive and spatially fixed infrastructural projects of post–World War II development, such as dams, power plants, and road networks. These were the instruments of societal transformation engineered by technocratic experts and government officials. Within this classic modernization paradigm, a collective actor (often the state) sought to achieve broad structural and infrastructural transformation that benefited the nation or "the public" as a whole. The devices we highlight arose against the backdrop of sustained and polymorphous critiques of this approach, along with successive waves of economic restructuring and fiscal crisis. In reacting to and against the perceived failures of the past, little development devices are designed to produce immediate, measurable and testable outcomes, and to rely on individuals or communities as both agents of development and arbiters of value.

The second frame for today's microtechnologies is the parallel emergence of humanitarianism as a mode and set of techniques for crisis response, including the establishment of intergovernmental agencies and

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nongovernmental organizations devoted to the care of distant others, as well as the standardization of associated mobile technologies like refugee camps. The devices we examine respond to perceived incapacities and failures of this aid regime, even while seeking to further its general goals of alleviating urgent needs and saving lives. Here, a key development is the recent turn to market logics—the treatment of these items as commodities more than gifts—ostensibly enlisting profit motives to achieve humanitarian ends. They thus strive to be "goods" in two senses, reflecting both ethical and economic ambitions, and combining care with self-interest.

Many of the devices examined in the articles that follow straddle these worlds, disturbing the constitutive distinctions between humanitarianism and development, and provoking a series of challenging questions about the identity of each. What has the project of development become when its interventions are focused on individual outcomes—or the outcomes of small communities—rather than a vision of longer-term societal transformation? What is a humanitarianism whose lifesaving interventions have to be sustained by market forces rather than charity, and that is alert to the often-perverse long-term effects of charitable interventions?

Those designing and promoting little development devices and humanitarian goods primarily target populations understood to be "infrastructurally marginal"—lacking connection to networked forms of modern provisioning, such as water, sewerage, communication, and electricity, or to services such as health care and finance. Sites in sub-Saharan Africa and South and Southeast Asia are notably prominent in the geography of these devices and provide the setting for a number of articles in this issue. Leaving aside the question of whether these devices can, in fact, operate successfully without more traditional infrastructures somewhere in the background (the articles in this issue suggest that in many cases, and in important ways, they cannot), we wanted to devote equal attention to the places where these devices are invented and built, and to the moral, political, and financial aspirations of those who design, fund, distribute, test, and evaluate them. The articles here thus cast light on new formations of international assistance that have taken shape in recent decades, linking traditional actors—such as development agencies and humanitarian organizations—with design schools and firms, global philanthropies, and startup companies. Here, the prominent geographies include Silicon Valley, Boston, New York, London, Geneva, Scandinavia, and Washington, D.C. We find curious mixtures of positivistic science, entrepreneurial culture, design, and moral virtue, along with rational choice economics and its behavioral variants. The (purported) rigors of experimentalism are combined with an aesthetics of parsimony and small scale: elegantly designed, functional objects replace the monument and spectacle of dams, power plants, or railroads.

At first glance, small scale may seem to

correspond to modest ambition. Little development devices and humanitarian goods are not instruments of revolution or "big push" modernization. Rather, they are tools to produce more attenuated improvement, hemmed in by limited means, and working under the shadow of past failures. But if these devices do not index revolutionary transformation, there is no lack of lofty ambition or salvational talk hovering around them. These devices are designed to save lives, restore communities, improve health, even save the world, all through a dream of scaling up micro-technologies to have macro effects.

At the same time, the design schools, philanthropies, and development agencies supporting these devices—not to mention university initiatives to foster "social entrepreneurship" and "maker spaces"—produce their own visions of the good. The articles that follow draw our attention to the ethics, technics, and worldview of the inhabitants of these milieus: an ethos of novelty, innovation, and care—the best and the brightest designing clever devices to circumvent the messy complications and entanglements of collective action. Here, the influence of earlier oppositional and alternative technology movements comes into focus: Joseph Schumacher's challenge to gigantism in *Small Is Beautiful*; the Whole Earth Catalog, with its ambition to bypass the great institutions of government, business, education and religion, and its celebration of tools that would enable the "individual to conduct his own education, find his own inspiration, shape his own environment, and share his adventure with whoever is interested." This more aptly describes the ethos of those who design little development devices than of all their intended users.

The articles that follow suggest that the project of creating little devices for developmental improvement or humanitarian care is fraught with tension. Born of a dream of being "off the grid," many turn out to rely on material, administrative, and political infrastructures. Some, indeed, may be best conceived of as hacks that deal with gaps, elisions, or breakdowns of such infrastructures, on which they remain dependent.

Another tension concerns the relationship between conceptions of local and universal qualities of life. Many of these devices aim to avoid a top-down variant of development or humanitarianism, limiting expenditure and putting more agency in the hands of those affected by the interventions. For this reason, they embrace minimalist designs that emphasize self-sufficiency of device and user rather than attempting to engineer a complex system. Yet minimalism is also an aspiration to baseline universality—deployability without regard to context—that often breaks down in practice.

Of course, many designers and implementers of these devices are acutely aware of these tensions and have sought to adjust their practices and their thinking in response. The age of the little development device and the humanitarian good stretches back at least to the 1970s or 1980s, and the articles here document the multiple waves of innovation, experimentation, success, failure, reflection, criticism, and adjustment within the field itself. In some cases, at least, the lofty ambition that initially accompanied these devices has been tempered. But the articles do not suggest that the project of creating and deploying little development devices is running out of steam or that it is time to return to the big, structural interventions of post-World War II development. Indeed, in documenting the original impulses and problems that animated these devices, the articles also serve to forestall, or at least to qualify, one of the more obvious and, perhaps, easy lines of criticism. Namely, that little development devices abandon the project of "real" change and forsake reassuringly forceful action by the state in the public interest. In place of such unified critique, the authors here offer a map of conceptual fault lines and suggest patterns of pressure and friction running through both planning mechanisms and material forms. Taken together, they point to an ongoing and open-ended exploration of examples, effects, and implications. In this spirit, the issue includes a catalog, in the tradition of the Whole Earth Catalog, inviting others to participate in assembling a collective cabinet of little curiosities.

LITTLE DEVELOPMENT DEVICES/HUMANITARIAN GOODS

LITTLE: These devices are little in a number of senses. First, they are light, inexpensive, scalable, and portable; they may be deployed experimentally and flexibly for small units of population. Second, they are little in the sense that they operate at the level of the "micro" in economics—their target is not the "national economy" or macroeconomic aggregations but individual preferences, aspirations, and calculations. Third, they are "minimal"; they are, for better or worse, deployed with relatively limited assumptions about the form of life into which they are to be inserted. None of this is to say that they need remain small in scale. Some have, indeed, been deployed by national governments and have large aspirations (e.g. affecting national poverty or mortality rates).

DEVELOPMENT: Although these devices may not define development in terms of national populations, they do aspire to improving conditions of existence and the quality of lives. They thus require and entail the assembly of new kinds of expertise, new visions of a better future (whether for individuals, communities, or nations), new articulations of populations, and new instruments.

DEVICES: Because they are deployed with "minimal" assumptions about context, a very great deal is packed into these devices themselves. Many depend on material technologies such as GPS, mobile communications, and cheap solar panels. But they may also be calculative devices, drawing on forms of accounting, and various kinds of expertise in modeling and forecasting.

HUMANITARIAN: These technical devices embody norms, models of how people make decisions, assumptions about what people want, and what constitutes a good life. These are, in short, devices that are designed to do good. They reflect an explicit desire to alleviate suffering and save lives. They focus on moments of present crisis and a future in which states may no longer have the capacity to build, manage or sustain universal infrastructures in territorial grids.

GOODS: These are things that also seek to do well (financially) while doing good. Humanitarian goods that are premised on conditions of state fragility often hold out the promise that they can transform that fragility in productive or profitable ways. Designs for things like solar lanterns or nutritionally fortified foods, for example, seek to generate economic value for a diverse array of investors, via sales to institutional consumers like humanitarian or aid organizations as well as directly to the poor. Thus, they present themselves as caring commodities rather than disinterested gifts. As they move through design and use, and through spaces of poverty and humanitarian emergency, they remind us of just how difficult it has become to imagine ways of expressing care and concern without fostering markets.

**STEPHEN J. COLLIER, JAMIE CROSS,
PETER REDFIELD**, and **ALICE STREET**
November 2017
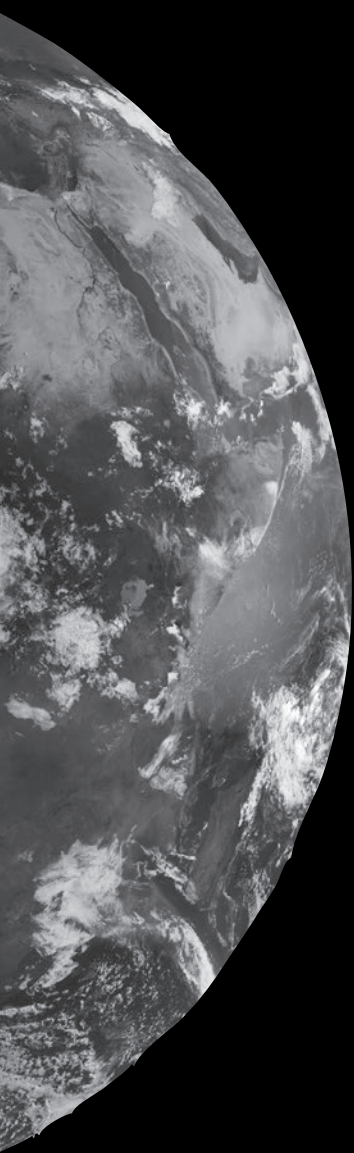
the whole limn catalog

of little humanitarian goods

THE WHOLE LIMN CATALOG

The Whole Earth Catalog, a magazine founded by Stewart Brand and published between 1968 and 1972, presented an array of small devices—from solar stoves to portable shelters—for self-sufficient living off the grid. The Catalog was animated by a utopian vision of escaping the deadening apparatuses of government, big business, education, and religion. It aimed to foster a "realm of intimate, personal power...of the individual to conduct his own education, find his own inspiration, shape his own environment, and share his adventure with whoever is interested." "We are as gods," the Catalog proclaimed, "and might as well get good at it."

By contrast, the entries in our *WHOLE LIMN CATALOG: of little humanitarian goods* do not seek to escape the large structures of mass society, but rather respond to their limited reach and unfulfilled promise of global inclusion. The image of the planet may still have salience as an index of fundamental ecological limits of life. But amid deepening self-recrimination over ecological damage, persistent poverty, and recurring humanitarian crisis, the Catalog's utopian vision of godlike self-awakening—though persistent—seems naïve, if not anachronistically modernist. The slogan "access to tools" also rings differently today. Although the creators of the items in our catalog may still seek to salvage a brighter future, they do so by targeting populations with unmet basic needs, as carefully measured by experts. These are devices for making do while living with limited access to modern infrastructure, not the expression of a preferred counter-identity or the ready means to self-fulfillment.

THE FOLDSCOPE

The foldscope is a microscope made from paper that offers 140x magnification and costs around $3. The foldscope can be used with a traditional eye-view mode, be connected to a smart phone camera, or coupled with a flashlight to enable projection microscopy. Foldscope's inventors, Stanford biologists Manu Prakash and Jim Cybulski, describe the device as a 'frugal science' project that democratizes science and makes research tools accessible and affordable to children, educators, researchers and amateur scientists worldwide. The foldscope, Manu Prakash claimed in his 2014 TED Talk will usher in a 'new paradigm of use and throw microscopy' and enable people living in developing countries to 'put a face to invisible monsters.'

In its initial stages, the project received financial backing from the Baxter Foundation, Coulter Foundation, Bill and Melinda Gates Foundation and Pew Foundation. Since 2016, it raised $393,358 on kickstarter from 8457 backers, 5199 of whom were based in the US. It also runs a foldscope donation campaign that enables backers to pledge donations to in-need projects, mostly schools and NGOs located in the Global South. Project SHINE in Tanzania, for example, has used microscopes donated by Foldscope to encourage water safety and hygiene practices among school pupils. On 17th September, Foldscope announced that it had launched its first shipment of over 5000 foldscope kits from China to the US. —*Alice Street*

SOLAR LANTERN

The solar lamp is a generic term for a small portable lighting system powered by a photovoltaic module of zero to 10 watts. When placed in sunlight, photons excite electrons in the module into higher states of energy, allowing them to act as charge carriers for electric current. The current is sufficient to charge an internal battery, allowing a bulb or light-emitting diode (LED) to be switched on in the dark. —*Jamie Cross*

UNHCR FAMILY TENT FOR COLD WEATHER WITH FIRE RETARDANT

The Family Tent has 16 m² main floor area, plus two 3.5 m² vestibules, for a total area of 23 m², double-fold with ground sheet.

It is the standard tent used by UNHCR/ICRC/IFRC and suitable for a family of 5 people, following the recommended minimum living area in hot and temperate climates (3.5 m² per person), and providing additional space for cold climates.

THE WHOLE LIMN CATALOG

THE DRINKABLE BOOK

The Drinkable Book is a paper based water filtration system, its pages infused with silver and copper nanoparticles that purify liquid poured through them. The initial prototype, developed by Theresa Dankovich as a hand-crafted volume with educational messages printed on tear-out half pages, received considerable press attention in 2015 after field trials in Bangladesh, Ghana, Haiti and South Africa. Dankovitch has since partnered with Jonathan Levine to establish Folia Water, which seeks to scale the concept into "the world's first water filter that costs pennies, not dollars." They marketed their initial product, the Safe Water Book™, to NGO partners who used it to purify 20 million liters of clean water, and then incorporated the resulting feedback into subsequent design of Folia Filters™ and the Keystone Funnel™. —*Peter Redfield*

GLUCOMETER STRIP

The labyrinth of foil inside a glucometer strip reveals a fragile chemistry. If you peel open the plastic covering, many inner circuits contain some version of biosensor technology, electrochemical cells screen-printed with gold or other precious metals and coated in places with enzymes. The foil serves as a conductor for electrons in a drop of blood, allowing a brand-matched glucometer machine to measure the charge a sample holds. —*Amy Moran-Thomas*
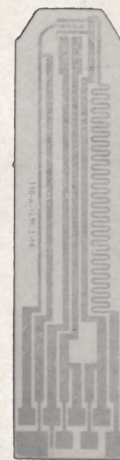
FLEXCARDS

A marke stall in Papua New Guinea offers cratch (or "flex") cards that people buy to top up their mobile phone airtime balances. 79 toea per minute

COOKSTOVE IMPROVEMENT

An ubiquitous feature of domestic life in rural India, the *chulha* is a hand-crafted, biofuel cookstove. Mewar Angithi is a simple steel grate inserted into existing *chulhas*. Named after the region of Mewar where it originated, the insert improves airflow by creating a channel between the stove floor and firewood. This separates ash buildup that can smother unburned wood and catches larger embers, allowing them to combust more completely. —*Meena Khandelwal and Kayley Lain*

MOBILE HEALTH

MOS@N, an experimental mobile health (mHealth) network providing medical monitoring and follow-up of pregnant women, is piloting the use of mobile devices in health care. MOS@N sends voice medical appointment reminders and health advice to "godmothers," community relays selected as part of the project to follow up with pregnant women in their respective villages. To do so, godmothers were provided with a mobile phone and a bicycle to facilitate their movement within the village as they travel to the local primary health care center (PHC). The cell phone has prerecorded health education messages for godmothers to play when convening maternal health awareness sessions. Equipped with phones and data connectivity, godmothers can reach remote populations to provide them with health advice and information.

THE WHOLE LIMN CATALOG

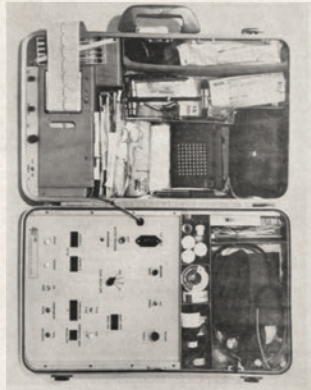Three safety hazards exist in the current design of the oxygen generator. They are:

a. The oxygen flow cannot be cut off once it is started. Blockage of the oxygen flow caused by crimping of the outlet hose or by stoppage of the canister port results in rapid pressure buildup and blowout of the canister at ~5 psig, and subsequent release of the burning reactants.

b. The active canister generates heat causing canister temperatures as high as 1000° F. Additionally, the temperature of the handle of the container may reach 350° F. The canister requires approximately an hour to cool to a temperature safe for handling. Such a hot canister presents a burn potential to personnel attempting to install a new canister, or to other individuals at the scene of an emergency if a hot canister is left behind. The hot container handle may burn the fingers of personnel attempting to change canisters, adjust the hanging position of the generator, or ignite a new oxygen canister.

CLINIC IN A SUITCASE

A clinic in a suitcase was designed by Lockheed Missile & Spacecraft Company for NASA in the early 1970s. It was considered for testing in the STARPAHC project on the Tohono O'odham reservation as part of the Space Technology Applied to Rural Papago Advanced Health Care project. The images show the external and internal view. The text comes from the initial testing report, which suggested some important flaws with the idealized technology. —*Jeremy Green*

THE PARTICIPATORY DEVELOPMENT TOOLKIT

The Participatory Development Toolkit is a "small briefcase (26 x 33 x 10 cm) containing 221 activity cards, 65 pictures, 11 charts, 1 guidebook"; it is "covered in brown pattered cloth, with leather handle and leather snap closure." It is decorated with drawings of women, abstract patterns, huts, trees, animals: drawings, the kit's guide explains, "by the Warli tribe, who live in the Sahadri mountains in Maharashtra state north of Bombay" and who are "known for their mythic vision of Mother Earth, their traditional agricultural methods, and their lack of caste differentiation"—*Christopher Kelty*

THE "KIT DE AGUA"

The Kit de Agua is a water quality testing device designed by student engineers at the Universidad Politécnica de Madrid's Escuela Técnica Superior de Ingeniería y Diseño Industrial (School of Engineering and Industrial Design), in cooperation with the NGO ONGAWA. Its designers describe it as a simple, low-cost apparatus for testing the contents and quality of drinking water in developing countries. It can be built using simple materials and without extensive knowledge of engineering or water chemistry. The components are modular and easy to find: a sealable plastic food container, a thermometer, a small circuit board, a USB port, PVC piping, a reused metal can or bottle, and a bit of Styrofoam. The Kit del Agua allows people to collect and test water samples for a variety of microbial and chemical contents. It maintains samples at a steady temperature so that they can be further evaluated at a low cost in local laboratories.

The Kit de Agua is currently being tested in several rural communities in western Nicaragua and evaluated at the Centro de Investigación en Salud, Trabajo y Ambiente (Center for the Study of Health, Work, and the Environment) at the National Autonomous University of Managua in León. Nicaraguan and Spanish scientists are aiming to use the Kit de Agua to help local water management committees better understand water quality issues so that they can both explain them to their constituents and be in a position to demand improvements in water service from the national water utility. A video produced (in Spanish) for a Nicaraguan audience explaining how the Kit de Agua works is here: https://www.youtube.com/watch?v=rvfctTABU9Q —*Alex Nading*

on band-aids and magic bullets

Peter Redfield probes the merits of small solutions to big problems.

"Suppose you have a cut on your finger. Cut a piece of Band-Aid from the strip, pull off the face-cloth and put the bandage over the wound. That's all there is to it. The bandage will stay right where you place it without tying. Can you imagine anything handier for the household or shop?"
— The Red Cross Messenger[1]

"New situations demand new magic."
— Evans-Pritchard (1937: 513)

THE ORIGIN OF THE HUMBLE BAND-AID OFFERS enticing material for corporate legend. In 1920, Earle Dickson was a cotton buyer for the medical supply company known as Johnson & Johnson in New Brunswick, New Jersey. Dickson, the story goes, had an accident-prone young wife named Josephine. Concerned about her tendency to acquire small injuries in the course of daily routines, he created an ingenious solution: a prepared set of strips combining sterile gauze, surgical tape and a crinoline fabric cover to keep it clean until use. Now, when his wife needed a dressing, she could simply take a strip, cut it to length, peel off the fabric and apply it herself. Minor wound care moved into the domain of self-treatment, a selling point that eventually convinced Dickson's employer to begin marketing it the following year. After a slow start, the new bandage caught on. The company displayed enough marketing imagination to distribute it for free to Boy Scout troops across the country, and by 1924 had begun to offer machine-cut Band-Aids in multiple sizes.

At the time of Dickson's innovation, Johnson & Johnson was already a well-established and innovative enterprise. The company derived from the labors of three industrious brothers of that name, the eldest of whom, Robert Wood, had trained as an apothecary. Inspired by the surgeon Joseph Lister's crusade for the merits of sterile surgery, he had gone into business with a fellow hygiene enthusiast, George Seabury, to create medical plasters and surgical dressings. In 1885 he joined his brothers in manufacturing ready-to-use dressings, and what came to be known as first-aid kits. By 1888, their product list included "accident and emergency cases" for antiseptic treatment, available in several sizes. After surveying railway surgeons across the country about their needs, the company launched a "railway station and factory supply case" containing a set of equipment that would enable station agents to respond to emergencies. In 1898 Johnson & Johnson supplied a "first aid packet" for soldiers fighting for the United States in the Spanish-American War, and in 1901 began producing first-aid instruction manuals. The range of kits on offer only would continue to grow with new transport inventions, like the automobile and airplane.[2] War was good to Johnson & Johnson. If not yet a fully transnational behemoth, it found ample opportunity in the mass suffering of European trenches even before the United States joined the First World War. At the close of the conflict, the company stood poised for new things, and the migration of bandages from battlefield to kitchen offered an expanding domestic front.[3]

A deeper history of wound care might complicate this story, adding rival accounts and antecedents of packaged dressings and plasters, as well as shifting conceptions of risk. (See Tarr and Tebeau 1997 for more on concern about "accidents" in early 20th-century America.)

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1 Quoted in http://www.kilmerhouse.com/2008/09/how-to-use-a-Band-Aid-brand-adhesive-bandage/
2 http://www.kilmerhouse.com/2013/06/from-1888-to-2013-celebrating-the-125th-birthday-of-the-first-aid-kit/ and http://www.kilmerhouse.com/2011/05/how-a-conversation-led-to-first-aid-kits/
3 http://www.kilmerhouse.com/2014/08/world-war-i-centennial-how-the-great-war-changed-johnson-johnson/

Likewise, a wider account of the rise of mass consumption and marketing might situate this particular story within a broad pattern of commodity domestication, such as campaigns to put cigarettes into the hands of women (Brandt 1996). Nonetheless, the corporate arc leading to the trademarked product officially known as the Band-Aid provides key elements for analysis. A simple but ingenious innovation, the adhesive bandage enabled the most ordinary and clumsy citizens to treat minor cuts and abrasions quickly and reliably wherever they found themselves. The early 20th century housewife and shop operator each gained new assurance in their mechanized environments, freed from worrying about minor hazards contained in the tools of their trade. Standardized and pre-sterilized, the new strip was mobile while packaged and stable once applied. It was easy to use, durable in action and boasted a long shelf-life. A box of them anticipated future accidents and stood prepared for the next minor emergency. An icon of middle-class safety and hygiene was born: children would grow up receiving quick treatment for mishaps, in increasingly colorful forms. The Band-Aid fits neatly into the first-aid kit, a larger and more capacious assemblage of items with similar intent. Deposited around the landscape of everyday industrial life—houses, cars, boats, offices, airplanes—such kits provided a small cache of prepared supplies available for any need that might suddenly arise. Beyond a lucrative business opportunity for corporations like Johnson & Johnson, these little packets enabled a new norm of quick response. One might even describe them as a minor form of medicalization, redefining small problems through anticipated care. At the very moment cries and finger-pointing might begin, a solution now was already at hand, just awaiting application.

In and of itself, it is hard to argue with a Band-Aid. As anyone who has used one knows, this little strip of adhesive tape and gauze offers an enchantingly simple and reliable response to a small cut, abrasion, blister, or splinter. Once sealed and padded, a minor injury can heal without further interference, causing less distress. If not fully therapeutic, or particularly effective at keeping a wound moist and sterile, the adhesive bandage would at least offer the advantage of protection as well as palliation. (Current medical consensus favors keeping wounds hydrated and covered; see Sood et al. 2014.) Here, at least, it would seem the overflow of 19th-century military and industrial production offered some small benefits to civilian society.

Yet the *Oxford English Dictionary* records a second entry for the term, describing "a temporary or makeshift solution to a problem," a *merely* palliative rather than properly curative result.[4] The connotation of this secondary usage is clearly negative, implying insufficiency and disappointment. Whatever the value of palliation for patient comfort, it does not address underlying causes and can appear unsatisfactory from a therapeutic perspective. Ultimately, a Band-Aid is a modest form of care, one that provides minor relief and minimal hygiene. It offers a poor substitute for a health clinic staffed by experts. No one would, or should, mistake it for a hospital. Moreover, a bandage placed over a poorly cleaned wound risks infection, ultimately concealing a festering sore. This second meaning of the term, then, introduces a dimension of critical distance into what would otherwise appear an innocuous, if not irreproachable good. Is a Band-Aid the right tool for the task? Is it enough? Or might it mask a deeper problem while providing false security?

To help frame an answer, consider a second metaphorical referent. Like the Band-Aid, the phrase "magic bullet" appears with some frequency in contemporary discussions related to international aid and global health (e.g. Cueto 2013). Frequently, the use in this context is both metaphorical and pejorative, indicating a misguided faith in a would-be technical solution to a socially complex problem. It implies that belief in technology can itself turn into magical thinking, misapprehending the nature of the problem and forgetting larger truths in a quest for simple answers. Indeed, the phrase clearly references European folk tradition, in which a silver bullet might slay a monster such as a werewolf.[5] The silver bullet suggests a fetish of the classic sort, an object thought to possess extraordinary powers by those who believe in it and congealed mystification by those who do not (e.g. Latour 2010; Scott-Smith 2013). At moments of duress,

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4 See *OED* entries under "Band-Aid" and "sticking plaster"; whereas the first only dates this secondary meaning to 1968, the latter traces it back to 1877. Since the generic term "plaster" describes a shifting lineage of therapeutic devices, from medicated pastes to industrial plastics, this secondary sense of inadequate treatment appears to well predate Dickson's iconic product.

5 A belief that obviously post-dates the invention and diffusion of firearms. See http://www.jurn.org/ejournal/Wett-stein-Werewolf.pdf

Poster for the 1940 film *Dr. Ehrlich's Magic Bullet,* directed by William Dieterle after a screenplay by John Huston.

facing a grave threat and the apparent failure of ordinary objects to meet it, magical thinking grows attractive. Surely someone should still act, and "do something"— even when confronting an apparently intractable challenge. The self-appointed task of any critic would then be to dispel fairy tales, unveiling illusions and exposing the false promises of an idol suffused with ontological and epistemological distortions. This is obviously easier to do when occupying a position of certainty and offering an alternative means to deal with whatever lurks beyond the door.

However, in medical history the magic bullet also signals another, positive framing, as a pharmaceutical concept introduced at the outset of the 20thcentury by the German Jewish scientist Paul Ehrlich of "drugs that go straight to their intended cell-structural targets" (Strebhardt and Ullrich 2008:1). Ehrlich's vision of a charmed projectile suggests an alternative basis for allure: the capacity for specific targeting, as demonstrated by the synthetic drug Salvarsan against syphilis. Although anyone familiar with chemotherapy might recognize shortfalls in the current application of this concept in cancer treatment, an updated, genetically informed version of his dream remains very much alive. Targeting enables a different sort of magic — that of altering scale. Narrowing scope reduces the field of reference from macro to micro, permitting tangible, immediate action within a delimited space of encounter. Targeting nonetheless retains a degree of grand ambition. If the right projectile dispatches its werewolf anywhere, at any time, then a path to universality runs precisely through heightened specificity. Targeting also implies a reduction of waste and a minimization of unintended consequences. The

objects it creates lend themselves to regimes of audit, testing, and recursive experimentation, while requiring neither mass labor mobilization nor state-level regulatory systems such as prior development regimes. A specific remedy shines brightly with the promise of efficiency. More might be accomplished with less, simply by concentrating the connection between problem and intervention. The contemporary magic bullet, then, may indeed be a fetish but one whose specific qualities of enchantment exemplify the historical moment. For tangibility clearly inspires those working on humanitarian objects and attracts the interest of influential publics. Rather than abstractly "doing good," it suggests the possibility of making a specific, located, and measurable difference (Good and Good 2012).

When does a Band-Aid appear deceptive? The question correlates directly with the imagined parameters and scale of expectations that surround it. Scale is an inherently relational concept: a response appears small and attenuated when problems loom large and long. An adhesive bandage might work wonderfully for a superficial cut or abrasion but not a deeper wound. Yet as the legacy of the magic bullet recalls, a delimited scope also could signify precision: the hope that something small might produce a desired effect with fewer secondary consequences. This magic might prove illusory. It might inflate expectations and promise more than it could ever deliver or provide cynical cover for inaction. Nonetheless, the fact of its failure should not wholly displace inadequacy onto the object itself.

Even a cursory historical sketch of Band-Aids and magic bullets, then, can serve to complicate dismissals of small responses to large problems. My intent is not to discount the critical impulse behind these offhand references, which all too often prove painfully accurate about the demonstrable inadequacy of a given intervention, or the exaggerated claims attached to it. Rather, I seek to reorient this critical frame slightly and attend to the assumptions it carries in the moment of its deployment. Is there not another kind of enchantment involved in criticizing interventions with generic demands for "structural change," whether those voicing the call are critical social scientists, activists, NGO practitioners, or even government ministers? For how is such change imagined? Does this imply the dream of a giant magic bomb, as it were, recalling political movements and revolutions past that upended norms in a complete and satisfyingly ambitious fashion? Or are these visions of expansive modernist planning and the kind of massive projects intent on sweeping,

epochal shifts: dams and waterworks, electrical grids, splitting the atom, the dawn of a new age? In their small and flawed utility, little devices can at least open larger questions that otherwise might remain foreclosed. If a welfare state now appears the lost guarantor of security, then how might it be reconceived to include more than a national population? If industrial capitalism ultimately lies at the root of contemporary concerns over inequality and environmental degradation, then what might alternatives to its material norms look like in technical terms?

Recognizing that the problem with Band-Aids is primarily one of scale and application, it follows that a critical response should not simply expose such deficiencies but also explore them in relation to any desired alternative. The concept of scale is complex, suggesting dimensions of both size and level, for which reason some geographers have advocated dispensing with the term and adopting a flatter spatial vocabulary (Marston et al. 2005). But even a less-hierarchal theoretical frame would need to attend to scope and connection, as well as to the sense of a future that Reinhart Koselleck (2004) terms the "horizon of expectation." Small and delimited interventions seem most inadequate when identified with neglect, cynical calculation or withered ambition. In other words, Band-Aids are most disturbing precisely when another response appears not just more desirable but also fully achievable. Conversely, it is the absence of faith in more comprehensive efforts, or fear of their side effects, that renders the tangibility of a targeted interventions singularly attractive. At moments when modernist utopian projects lose their grip on collective imagination, a cult of micro-interventions grows stronger, and in turn inspires critical nostalgia.

Easy dismissals of "micro" devices simply in terms of their meager size or likely failure, then, run the risk of trading one fetish for another: assuming that the real path to the future always lies in familiar "macro" technologies and planning. In an instant, the very industrial forms that might elicit ridicule from an ecological perspective (if not outright prophecies of doom, when framed by climate change and the Anthropocene), re-emerge as guarantors of social justice. Problems associated with actually existing welfare states and national infrastructural grids vanish—like rabbits from a hat—with the suffering identified in their retreat and inadequate coverage. Somewhere between such oscillating fantasies lies the harder work

of negotiating ambitions around development devices both large and small, and recognizing the significance of older forms without simply projecting them forward.

By way of illustration, let's leapfrog from Dickson's Band-Aid and domestic self-care in early 20th-century America to a contemporary little device, and trace its uncertain career as a magic bullet in international aid. The Peepoo is a "personal single-use toilet" designed for use in poor urban settings and under emergency conditions. Created by a Swedish architect, and subsequently developed and distributed by a small Swedish social enterprise known as the Peepoople, it offers a simple means to dispose of human waste, neutralize its pathogens, and transform it into fertilizer, all in one go. Modeled on the "flying toilet" method of using plastic bags—an all too real phenomenon of urban slum life—the Peepoo consists of a double-layered sack of biodegradable plastic with a small pouch of urea inside. As explained on the Peepoople website, the addition of this common fertilizer effects a magical transformation:

When the urea in Peepoo comes into contact with feces or urine, a breakdown into ammonia and carbonate takes place, driven by enzymes that naturally occur in feces. As the urea is broken down, the pH-value of the material increases and sanitization begins. Disease-causing microorganisms are inactivated after four weeks. Because dangerous bacteria are inactivated, there is no methane gas development from the feces inside Peepoo.[6]

Since the bag itself is fully biodegradable ("a mixture of aromatic co-polyesters and polylactic acid … with small additives of wax and lime") and urea is a non-hazardous chemical, the eventual result is a safe and valuable bundle of nutrients for farming. In a miracle of modern alchemy, the Peepoo transforms waste into a potential commodity. Accepting the addition of fluid or toilet paper, it can handle the product of both "washers" and "wipers" equally.

However minimalist, it thus holds an eco-utopian promise of closing a circle even as it fulfills a humanitarian ambition of satisfying a vital human need. If incorporated into a micro-enterprise of fertilizer production, it might even offer possibilities for income and a modest means for economic development. At the same time, it requires neither water nor permanent space; it is fully mobile and can adjust to circumstances. The Peepoo is not simply a better plastic bag, then, but a serious engagement with

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6 http://www.peepoople.com/information/faq/

a set of nested problems. Intended as both a humanitarian good and a development device—a caring commodity that also promises improvement—it additionally recognizes ecological concerns about human waste in urban settings. Carefully targeted, it would appear a very magic bullet indeed.

As with many such would-be solutions, however, the Peepoo has struggled to gain traction in practice. Even this admirably simple concept required considerable testing to produce the right technical variation and eventually a set of accompanying accessories. The size of the bag proved a balancing act, since the goal was to be just large enough for a single use; in addition to wasting material and adding to expense, a too-large container might invite reuse, which would counteract its hygienic ambitions. Scale is also a magical concept in market terms, here affecting both manufacture and distribution of everything from the biodegradable material to the potential fertilizer product. Only when amplified to mass production, with offsets of potential revenue, could the Peepoo ever hope to compete with ordinary plastic receptacles. Until then it would require subvention of some sort or another or an extensive marketing campaign to convince potential consumers of its superiority. Moreover, the very logic of its materials gave the Peepoo a relatively short shelf life; since biodegradable material is sensitive and deteriorates by design, the bag requires more durable outer packaging to last even two years. In other words, this product cannot sit and bide its time. To properly function and fulfill its promise, it demands regular use, in sufficient volume.

Fostering a reliable population of Peepoo users has proved elusive, particularly when pursuing Peepoople's ambition of commercial sustainability. Although potentially valuable in emergency settings (in floods, for example, when sanitation systems are disrupted and it is hard to build latrines), the uncertain frequency of such demand made it hard to translate this potential into a stable consumer base. A set of field trials and experiments in a number of sites, including Bangladesh, Haiti, and Pakistan, finally yielded a couple of community projects in Kenya. But these efforts too soon encountered friction. Sanitation, of course, is more than a technical matter, as it involves an array of intimate and often sensitive social relations and cultural concerns. As a Peepoople representative told me in 2014, "It's easy to sit from afar and say, 'Oh, I have a great idea,' without listening to people or considering the cultural aspect. Once you do then you realize it's more complicated." Although encouraged by studies that showed "high user acceptability," the company still struggled to create durable demand between price, on the one hand, and preference, on the other. Even a better plastic bag was not the most coveted sanitation device. As the same representative explained, "It's a product that requires a lot of explanation and so comes with a lot of explanation. It's not like a mobile phone that everybody wants, no questions asked, but rather needs social marketing for people to understand why this is important." At the same time Peepoople's efforts to market human fertilizer ran into cultural resistance and fears over contaminating food. To avoid the stigma of perceived pollution the company refocused on marketing it to tree farmers.

Production likewise proved a problem. After beginning as an enterprise in Kenya with semi-manual production, the Peepoople then sought to automate and lower costs by shifting manufacture to Germany, since the requisite materials were not available in Kenya and costly to import. They also experimented with automated machinery, built by a German company that made diaper machines. Subsequently they moved production to Sweden to consolidate near their headquarters. But the actual demand never reached a level sufficient to justify the enterprise, and in late 2015 the Swedish office closed. The Nairobi branch remained open, if

THE PEEPOO TOILET: "Peepoo is designed to be used once, while sitting, squatting or standing. For more convenience, Peepoo can also be placed on the Peepoo Kiti or on a small bucket and used as a chamber pot. Because Peepoo is small, lightweight and not fixed in place, it can easily be used indoors or carried to a secluded spot for use as a private toilet."
PEEPOOPLE.COM

relatively somnolent when I visited in the following year, and the experiment appeared to have stalled awaiting resumption of local manufacture. However, in October 2016 a Stockholm-based Christian NGO called International Aid Services (IAS) acquired the Peepoople brand, vowing to keep the dream alive. At the time the user base consisted of some 20,000 people living in the Kibera slum in Nairobi, a market subvented by charitable donations.

The Peepoo, then, would seem a classic magic bullet, its earnest charms wavering while seeking an imagined target. From a critical perspective it appears a mere Band-Aid, a minimal improvement that fails to address the underlying factors that might drive someone to resort to a plastic bag in the first place. Some people I've discussed this with find the very concept offensive, and many raise trenchant concerns about its viability as a development device.[7] Such evaluations, however, should not overlook larger questions exposed by this simple sack with eco-utopian sensibilities. For the flush toilet, whether enveloped in middle class privacy or arrayed in a public block, may itself not offer a viable alternative, particularly when viewed from arid settings or at a planetary scale (Redfield and Robins 2016). An environmental perspective would suggest that water-based sanitation begs for reinvention, not further mass diffusion. In its own, humble way, the Peepoo opens this urban norm, calls attention to an exceptional violation—the plastic bag—and serves as a reminder of the deeper problem of waste. In this light, its shortcomings might yield not the end of the story but rather another beginning. ■

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7   For commentary see, e.g. https://saniblog.org/2010/04/30/the-peepoo-bag-system-top-or-flop/

BIBLIOGRAPHY

Brandt, Allan M. 1996. Recruiting women smokers: The engineering of consent. *Journal of the American Medical Women's Association,* 51(1-2): 63-66.

Cueto, Marcos. 2013. "A Return to the Magic Bullet? Malaria and Global Health in the Twenty-First Century." In *When People Come First: Critical Studies in Global Health*, Biehl and Petryna eds. Princeton: Princeton University Press,: 30-53.

Evans-Pritchard, E.E. 1937. *Witchcraft, Oracles and Magic among the Azande.* Oxford: Claredon Press.

Good, Byron J. and Mary-Jo DelVecchio Good. 2012. "'To make a difference ....': Narrative Desire in Global Medicine." *Narrative Inquiry in Bioethics*, 2(2): 121–124.

Koselleck, Reinhart. 2004. *Futures Past: On the Semantics of Historical Time.* New York: Columbia University Press.

Latour, Bruno. 2010. *On the Modern Cult of the Factish Gods.* Durham, NC: Duke University Press.

Marston, Sallie A.; John Paul Jones III; Keith Woodward. 2005. "Human Geography without Scale," *Transactions of the Institute of British Geographers*, New Series, 30(4): 416-432.

Redfield, Peter and Steven Robins. 2016. "An Index of Waste: Humanitarian Design, 'Dignified Living' and the Politics of Infrastructure in Cape Town." *Anthropology Southern Africa*, 39(2): 145-162.

Scott-Smith, Tom. 2013. "The Fetishism of Humanitarian Objects and the Management of Malnutrition in Emergencies." *Third World Quarterly* 34(5): 913-928.

Sood, Aditya; Mark S. Granick; and Nancy L. Tomaselli. 2014. "Wound Dressings and Comparative Effectiveness Data." *Advances in Wound Care*, 3(8): 511-529. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4121107/

Strebhardt, Klaus and Axel Ullrich. 2008. "Paul Ehrlich's magic bullet concept: 100 years of progress." *Nature Reviews Cancer* 8(6): 473-480.

Tarr, Joel and Mark Tebeau. 1997. "Housewives as Home Safety Managers: The Changing Perception of the Home as a Place of Hazard and Risk, 1870-1940." In *Accidents in History: Injuries, Fatalities and Social Relations*, Cooter and Luckin eds . Amsterdam: Rodopi: 196-233.

What are the infrastructural requirements of mobile health? **Vincent Duclos** reports on the MOS@N experiment in Burkina Faso.

demanding mobile health

IN 2013, MOS@N, an experimental mobile health (mHealth) network providing medical monitoring and follow-up of pregnant women, was launched in the health district of Nouna in rural Burkina Faso. MOS@N is implemented by the Centre de Recherche en Santé de Nouna (CRSN), a national health research center. It is funded by Canada's International Development Research Centre (IDRC) and supported by the Ministry of Health. MOS@N operates in an area where maternal mortality remains a major public health challenge, and where the rates of antenatal care consultation (ANC) attendance and of assisted delivery are relatively low. It aims to pilot the use of mobile devices to improve the use of health care services by pregnant women. MOS@N sends voice medical appointment reminders and health advice to "godmothers," community relays selected as part of the project to follow up with pregnant women in their respective villages. To do so, godmothers were provided with a mobile phone and a bicycle to facilitate their movement within the village as they travel to the local

Fig. 1. The entrance of the CRSN. Photo by author.

primary health care center (PHC). The cell phone has prerecorded health education messages for godmothers to play when convening maternal health awareness sessions. Equipped with phones and data connectivity, godmothers can reach remote populations to provide them with health advice and information.

MOS@N also includes an electronic health record system that runs on computers installed for that purpose at local PHCs. Since none of the local PHCs are connected to the electricity grid, they were also provided solar panels to keep the computers running. Health workers—nurses and midwives—at PHCs are in charge of entering patient data into the system, which then automatically generates the reminders sent to the godmothers' phones. In 26 villages, served by five different PHCs, MOS@N brings together pregnant women, godmothers, rural PHCs, health workers, technicians, public health researchers, server rooms, an automatic callback system, bicycles, computers, portable solar panels, batteries, cell phones and refill cards, not to mention husbands, dirt roads, bicycle repair stations, heavy rains, and village authorities, in an experimental network.

The number of mHealth projects and systems implemented in low- and middle-income countries has doubled in the past five years. Driven by the leadership of the World Health Organization (WHO), global health organizations, researchers, and donors increasingly expect data connectivity to strengthen health systems, reduce costs for access to health care, and thus contribute to health equity. Connectivity promises to bring new bodies and populations into sight, alleviating suffering and saving lives; any obstacle to the flow of information is increasingly seen as the cause of suffering and loss of life.

In Burkina Faso too, mHealth networks are multiplying. Most initiatives are aimed at making the national health system more data driven, with a strong

emphasis on maternal and child health. In the wake of the Ebola virus epidemic in West Africa, initiatives aimed at digitizing public health surveillance and outbreak response management have also been on the rise. Organizations involved in the funding, design, and deployment of mHealth in Burkina Faso include the Centre Muraz, Terre des Hommes, WHO, Bill & Melinda Gates Foundation, UNICEF, and Grand Challenges Canada. Notable projects include the Integrated eDiagnostic Approach (IeDA), which uses mHealth devices to provide diagnostic support to health care workers and to collect data made available to public health decision makers. Another example is the integration of the WHO-sponsored Maternal Death Surveillance and Response (MDSR) into the national disease surveillance system, requiring health workers to immediately report cases of maternal death via mobile phones. The Burkina Faso Ministry of Health has been supportive of these developments, and it has recently adopted a nationwide strategy to integrate digital technologies into the national health system.

MOS@N was designed in response to a call for proposals by the IDRC to attract projects that would contribute to building evidence of the impact of digital technologies on health systems. There were three specific expectations:

❶ ACCESS. Information and communication technologies (ICTs) suggest the projects have the potential to make health systems more equitable through better access to health care and information. IDRC takes up a popular theme within mHealth literature: mobile devices are expected to strengthen equity by reducing disparities related to cost, distance, and inadequate health infrastructure (Mehl and Labrique 2014:184). They are expected to enable relatively transparent, seamless communication, thus facilitating the provision of health services to previously underserved populations.

❷ OPERATIONAL KNOWLEDGE. IDRC-supported projects should contribute in bridging the gap between research and implementation. Exemplifying the rising popularity of operational research (or operations research) in global health, projects were expected to generate evidence for decision making by studying the process of implementation itself rather than focusing only on health outcomes. IDRC's call thus insisted that selected projects should examine *how* ICTs were being integrated into resource-constrained settings by paying attention to the local usage and adoption of mobile technology. Although IDRC's call was premised on the notion that connectivity should improve access to health care, it aimed to find out what "works" and what does not in various contexts.

❸ REPLICABILITY. IDRC's call directly responded to the lack of evidence in the literature about the scaling of mHealth initiatives into health systems. The vast

majority of mHealth interventions are indeed only pilot projects, and remain so. Proposals selected by IDRC were to pay particular attention to the potential for scalability or replicability. As I suggest, MOS@N indeed raises the problem of scale: How can its implementation process be replicated so that connectivity produces similar effects in different settings?

ENCLOSURES AND EXPENDITURES

MOS@N is trying to facilitate the wireless mobility of data. However, soon after it was launched, it became evident that individuals, devices, data, and information assembled in MOS@N do not move easily. Their circulation is severely hindered, if not altogether immobilized. Obstacles are many and include poor geographical access to PHCs, considering that women often live between 5 and 10 kilometers from the nearest centers; the rainy season, when roads become impassable—sandy, clayey, if not literally flooded; a livelihood depending on women working in the fields, away from home and thus from solar panel chargers, and often from cell phone signals, too; devices that were not as portable as expected, with godmothers carrying their phones in their hands, an obstacle that some have overcome by crafting neck pouches; gender dynamics, with some husbands trying to keep godmothers away from pregnant women, or pregnant women away from the PHC; broken things, including phones, solar panels, bicycles, and computers; unreliable network connectivity; unintelligible voice messages; difficulties using mobile phones and computers; health workers lacking time to enter health data into the computer, compromising its circulation; women who won't discuss their health status with godmothers or health workers; and conflicts between health workers, godmothers, and pregnant women. A godmother summarizes some of these obstacles:

> *The other day, when I was accompanying a pregnant woman, we started walking but we did not reach the Bagala Phc on time so she delivered on the road. I called the nurse at the Sikoro Phc [to which the godmother would normally take women of her village, except during the rainy season] to let her know that one of my women had just delivered on the road. I then brought her to Bagala but the nurse refused to see her. She kept asking why she delivered at home. I explained that we really were on the road to come here, and that the umbilical cord was not cut yet and her clothes were soiled with blood. But she reprimanded us, so we left. I gave my phone to her husband who then called the Sikoro nurse to let her know. In the end we brought her back home to cut the umbilical cord ourselves.*

The mobility of data, which MOS@N aims to facilitate, in fact still entails the mobility of devices and bodies. And it entails significant expenditure. First, there

Fig. 2. Adverse Road Conditions. Photo by DAKISSAGA Judion.

is physical labor. MOS@N generates displacement, especially for godmothers. Although they were provided with a bicycle to facilitate their travels, the role of godmothers has gradually evolved to include the accompaniment to PHCs. As the story above shows, godmothers now walk and ride along with pregnant women. They also assist health workers during deliveries. This new role was improvised in response to the technical difficulties in generating automatic voice reminders. Indeed, as a result of many of the challenges listed above, godmothers generally do not receive the automatic reminders on time, if at all, as was initially planned. Therefore, they may spend hours on the road every day depending on where they live.

Mobility in MOS@N also comes with material and energy expenditure. Batteries, cell phones, and portable solar panels are often recharged, disposed of, and replaced. Bicycles are repaired and replaced. Bandwidth is consumed. Project managers move across the district, not to mention donors, researchers, and other visitors traveling to Nouna. MOS@N also comes with a significant increase in workload for health workers, who have to enter patient data into the computer after each consultation, not to mention the tireless work of MOS@N's field manager, logisticians, technicians, and supervisors. Improved access to health care and information in MOS@N has little to do with an easy circulation—of devices, godmothers, and messages—enabled by a stable, underlying network infrastructure. MOS@N foregrounds the corporeal and material demands of media mobility. Little devices apparently carry more than their own weight.

MEDIA-WORLDS

"Knowledge is like light. Weightless and intangible, it can easily travel the world, enlightening the lives of people everywhere" (World Bank 1999:1). It is with

these words that a flagship World Development Report on knowledge for development began before emphasizing that millions of children die because of their parents' lack of access to knowledge. Since the report was published almost two decades ago, mHealth devices have come to embody better than any other technology the medium promising such a life-saving access to knowledge. As such, they display a strong capacity to enchant and mobilize affect (Harvey and Knox 2012; Larkin 2013). The affective power of mHealth devices is directly related to their technical qualities, including their compact size and portability. Although the hype surrounding mHealth has lessened in recent years—a situation acknowledged by IDRC's insistence on the need to determine what "works" and what does not—the underlying vision of mobile devices as fluid, neutral conduits for the flow of information remains largely unchallenged (Duclos, 2016).

In contrast to this understanding of media devices, ethnographic material on MOS@N points to a conception of media as messy, unpredictable, and transformational. In MOS@N, media devices not only *carry* symbols and meanings but actually shape connections and transform who/what is connected. This is partly due to the expenditures that come with failing data connectivity, resulting in godmothers still using their phones but now also walking with pregnant women to monitor their attendance to ANCs. Although we are left speculating about the effects of reliable automatic reminders, what is certain is that MOS@N alters individual and collective existence in Nouna in far-reaching ways.

A primary illustration of this lies in how godmothers are not merely *connected* to PHCs through mobile devices but in fact have come to think of themselves as the *intermediaries* between PHCs and their community: "We act as intermediaries between health workers and communities." "The main effect of the project is that now villagers are not afraid of health workers anymore." Or, in the words of a nurse speaking of godmothers:

Godmothers are extremely useful because here at the PHC, we do not know people in the community. Because they live in the villages, they have become our mouths and our ears with the population... I'm a stranger here, but they know everyone. Who else could get them to participate in our activities? Now, all we have to do is call them [the godmothers].

In a sense, godmothers, not mobile phones, are MOS@N's primary mediating devices. Godmothers of course are not passive conduits, and their work of mediation may have unforeseen effects. They spend considerable time with midwives and nurses, gaining practical knowledge and experience, but also experiencing conflicts and performing tasks not designed as part of MOS@N. Godmothers have assisted women delivering on their way to the PHC, stayed several nights at the PHC,

cleaned up the PHC, and have mobilized local women as part of mass vaccination campaigns. Some have lent their phone to their children so that they could listen to music, sometimes never to see it back in working order. Others have forgotten to deliver messages, or delivered them late, or to the wrong person. Overall, though, godmothers and their phones have been described as a reassuring presence.

MOS@N has also had a significant impact on the organization of community life in Nouna. Cell phone ownership, accompaniment, and health education sessions have brought godmothers considerable social recognition. It has changed the way they are perceived. Neighbors, family members, and children borrow their phones. Some are called "doctors," or are given small presents. In some cases, the role of godmother has come with emotional hardship. Their husbands sometimes frown upon their ownership of mobile phones. Resentment from fellow villagers is also common. Godmothers can, for instance, be accused of spreading rumors, or of deception. The confidential nature of pregnancy, the age of godmothers (in some cases younger than the women they follow), jealousy over the choice of the godmother (and her stipend and equipment), or health complications may all contribute in causing tension, and in one case even leading to the banishment of a godmother and her family from their village. In general, though, when speaking of MOS@N godmothers express sentiments of satisfaction, excitement, and deep pride. Being a godmother arguably comes with a new orientation to others and to the world.

THE FUTURES OF MOS@N

At the time of writing, funding had run out and MOS@N had come to an end. MOS@N was designed and deployed as a pilot project. As mentioned earlier, MOS@N had to improve access to health care and information to be considered successful. To a large extent, MOS@N has done just that. In addition to creating unexpected relationships, MOS@N has generated measurable public health outcomes showing significant improvement in antenatal attendance and assisted delivery rates in participating villages. MOS@N was also expected to generate data for global health donors/funders/policymakers, particularly about how it achieved this outcome, and how this process could be scaled. This is where success became harder to measure. How could MOS@N lead to something else? Can it be replicated and, if so, under what conditions?

As discussed earlier, the mobility of data in MOS@N came at a heavy cost, whether it was in terms of physical labor, or material and energy expenditure. MOS@N depends on a persistent and demanding care for the relations that constitute it as a media-world. In a related manner, MOS@N relied on a high degree of improvisation, or what could be considered an "experimental" ethos. It is important to emphasize that researchers at the CRSN were aware that MOS@N remained

largely experimental. Although this was their first mHealth project, they knew, because they had worked closely with local communities in the past decade, that the demands placed upon mHealth within these communities might differ from their own. MOS@N involved qualitative research aimed at exploring these demands, at examining the project's effect, and at fine-tuning it along the way.

In other words, researchers at the CRSN were aware of what they did not know, which is the problem: now that they are looking for funding to scale the network, there is *still* much they do not know. They have gained implementation skills, but can they trust that "more of the same" will lead to future success when the "same" is in itself contingent and unpredictable? To what extent does the experimental ethos guiding MOS@N's implementation lend itself to formalization? What if the way MOS@N succeeded does not suggest easy replicability? After all, MOS@N does deflate any expectation that mHealth networks can be extended in a parsimonious, predictable manner. CRSN researchers did pay close attention to the processes that breathe life into MOS@N

and make it work, thus at least partially meeting IDRC's expectation for operational knowledge. But rendering processes visible does not suddenly make these processes amenable to prediction. The future of MOS@N faces a conundrum critical to the deployment of little development devices in general: only out of fragile, messy connections do consistencies appear to emerge. ∎

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BIBLIOGRAPHY
Duclos, V. 2016. The map and the territory: An ethnographic study of the low utilisation of a global eHealth network. *Journal of Information Technology* 31(4):334–346.
Harvey, P., and H. Knox. 2012. The Enchantments of Infrastructure. *Mobilities* 7(4):521–536.
Larkin, B. 2013. The Politics and Poetics of Infrastructure. *Annual Review of Anthropology* 42(1):327–343.
Mehl, G., and A. Labrique. 2014. Prioritizing integrated mHealth strategies for universal health coverage. *Science* 345(6202):1284–1287.
World Bank. 1999. *World Development Report 1998/99: Knowledge for Development.* New York, NY: Oxford University Press.

welcome to
excrementa

Brenda Chalfin and **Xhulio Binjaku** imagine designs for the future with Dwelling–Based Public Toilets in urban Ghana.

THE INTRODUCTION

Combining architectural models and drawings, graphic texts, and photographs, the following section is an exercise in critical design anthropology, serving a dual purpose of documentation and provocation. Building on African solutions to African problems—namely the shortage of urban sanitary facilities—Excrementa Estates promotes innovative multi-use dwelling design. Four design models are featured: *Stomach Has No Holiday, Adepa, Lady Di,* and *Doctor.* Each combines private residential space with toilets and baths available to the wider public on a fee-for-service basis. In development parlance, these can be glossed as dwelling-based public toilets (DBPTs).

All of the designs draw from Ghana's edge-city of Ashaiman. Located near Ghana's port of Tema and national capital, Accra, Ashaiman is a fast-growing urban settlement largely occupied by working-class migrants and transients with access to no or low-quality dwellings. The city has no central sewage system and limited municipal facilities. Nevertheless, due to the low price of land and proximity to Ghana's commercial core, Ashaiman is also home to an upwardly mobile social stratum. With space, capital, and status to spare, many well-off households invest in excrement-based enterprise, tapping the bodily needs and pocketbooks of less prosperous neighbors. Variations on a theme, the four models highlighted here afford different opportunities for privacy, propriety, and enterprise development

and offer a range of for-profit sanitary solutions, from flush and squat toilets and showers and baths to tap, tank, and purified water; water closet; septic tank; and pit latrine. Each one is already in use in the city. All of the DBPTs showcased offer a distinctive synthesis of domestic space, public access, sanitary infrastructure, and commercial imperatives in a context of minimal state provisioning.

These popularly derived solutions to pressing urban and human needs are presented via customized real estate brochures, a promotional and informational modality common across the African continent. The brochures are juxtaposed with architectural drawings and three-dimensional models derived from the structures built and used by Ashaiman residents. This format provides a way to ponder the viability of corporatized mass production of vernacular problem solving. Mixing low and high, public service and for-profit urban sanitation solutions, and aestheticized abstraction and on-the-ground realities, Excrementa Estates uses the conditions of the present to imagine designs for the future in Africa's fast-growing cities. Abstracted and miniaturized, these designs for living and the pan-human need for bodily care and evacuation raise questions about the source, scale, and replicability of "development devices." Although the sanitary solutions found in Ashaiman can be packaged and promoted, their capacity for circulation and adaptation is open to debate.

THE MODELS

STOMACH HAS NO HOLIDAY is situated amid the shanties of Ashaiman's working poor. With 16 toilets and 8 showers stalls, it is near but detached from the owner-operator's family home among a cluster of other family-based enterprises. A source of retirement income and status recognition for the proprietor, Stomach represents a beacon of prosperity and service provision in an otherwise impoverished locale. Bucking the municipality's efforts to control its operation or design, the low-tech, low-cost, yet well-maintained pit latrine offers affordability for the local populace and promises profits and permanence in a largely transient space.

ADEPA (a Twi term meaning "It's nice") is a compact enclosure containing eight top-of-the-line flush water closet (WC) toilets and porcelain hand sinks. Situated at the rear of the domicile, its separate entrance sets it apart from residential space, which is close enough for convenient monitoring and servicing yet affords privacy. Located in a long-settled neighborhood of large compound-style homes, Adepa is an attractive alternative to the overburdened and sensorially offensive municipal toilet. Despite the steep price of entry, Adepa is well patronized due to the high quality of service and good reputation of its proprietors. Toilet-related services and socializing extend into the public space and thoroughfares surrounding Adepa, all the while maintaining respect and discretion for customers.

THE LADY DI DBPT is altogether different in design. Contiguous with the family living area, this 20-toilet and 12-bath complex is equivalent in size to the already spacious home to which it is connected. Combining the toilet and bath enterprise with a lucrative water business consisting of an on-site borehole, multiple storage tanks, and a dedicated filtration system, there is no clear boundary between dwelling space and commercial operations. As such, toilet customers and toilet cleaners are incorporated into household life. In turn, the businesswoman and her female offspring who run, own, and live within the facility gain wealth, regard, and a broad network of dependents by keeping waste-work at home.

THE DOCTOR depicts a DBPT owned and operated by a prominent physician. Located on an expansive lot in an up-and-coming neighborhood well beyond Ashaiman's congested commercial core, the toilet occupies the entirety of a structure originally built to serve as a residence. Now converted to a toilet facility, with 14 men's rooms on one side and 14 ladies' rooms on the other, the only dwelling space that remains is the office area reserved for the attendants; the doctor-owner lives elsewhere. The attractive fence, decorated gate, airy veranda, and large lot provide cover for a multi-corridor shower area. Blending in with neighboring domestic structures, this large-scale facility is well prepared to handle urban infill.

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the legitimizing model
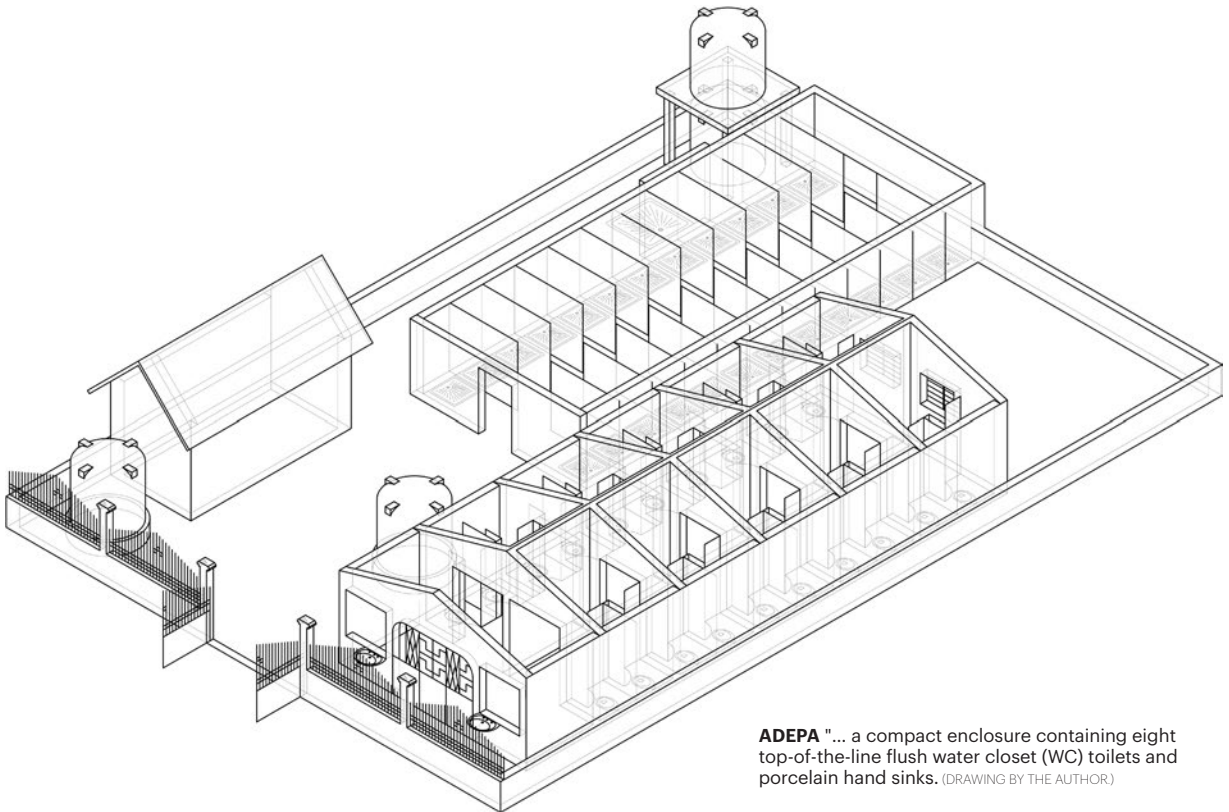
ADEPA "... a compact enclosure containing eight top-of-the-line flush water closet (WC) toilets and porcelain hand sinks. (DRAWING BY THE AUTHOR.)

Xhulio Binjaku explores the role of the model in upholding regimes of power, expertise, and commerce and explains the inspiration for Excrementa Estates.

IN ARCHITECTURE SCHOOLS, models are the most direct way for students to communicate their designs so others can understand. The thinking goes: If the design can be physically modeled to scale, it most likely can be built. In this way, models are a way to legitimize design. Of course, there is a long history of architecture being used as a way to legitimize political power (religious buildings, state houses, prisons, etc.), but before the built structure, there is usually a model to solidify ideas. Known to designers and defined by Jane Bennett (2010:6), models have *thing-power*, "the curious ability of inanimate objects to animate, to act, to produce effects dramatic and subtle." *Thing-power* does not necessarily rely on cultural significance but on the model's material body. The common wisdom passed down from professional architects to students is that clients love models. The model really sells the project; it is a direct translation from *thing-power* to capital through its physicality.

English architects Jane Drew and Maxwell Fry, who

Jane Drew and Maxwell Fry over a housing model to be deployed in Ghana.

worked on the plans of Tema, Ghana's planned modern city, used models of sanitary and "climactically designed" village units to persuade authorities and villagers of the legitimacy of their design. Though sensitive to climate and villagers' needs, the project was rooted in the politics of the neocolonial English New Town. When the villagers disapproved of their design, they vandalized the prototypes (Provoost 2017a), lashing out against the models.

After independence from England in 1957, Ghana's new president Kwame Nkrumah let go of Fry and Drew and hired Greek architect-planner Constantine Doxiadis to design a large-scale and fast-paced development for Tema. Doxiadis's master plan featured a modernist grid slightly on the diagonal to take advantage of winds. Doxiadis's master plan was to "facilitate social cohesion" among many different communities migrating to Tema for work; however, his plan was rigidly hierarchical,
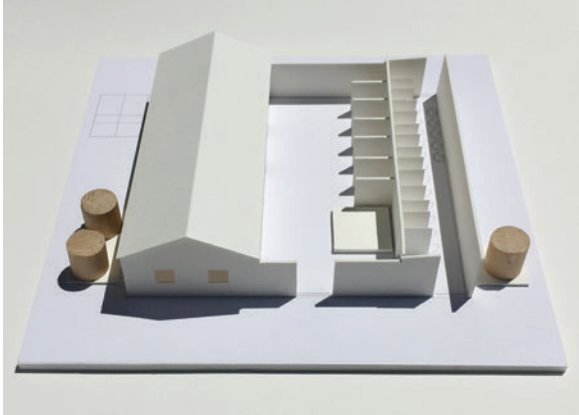
LEFT (FROM TOP TO BOTTOM): *Adepa, The Doctor,* and S*tomach Has No Holiday.*
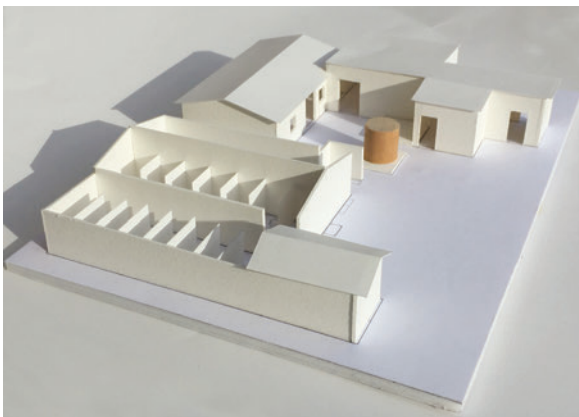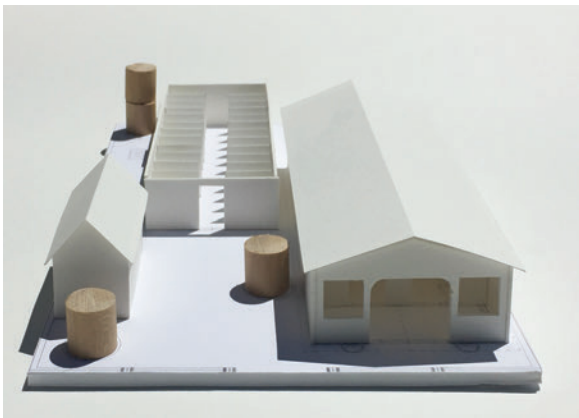
separated by different income classes (Proovost 2017b). Community 9, designed for the poorest, featured a plot of land where migrants could build their own homes. Just north of Community 9 grew Ashaiman, a largely self-organized sister city that lacked formal infrastructure.

Doxiadis's hasty planning resulted in the popular solution of what Brenda Chalfin calls "dwelling-based public toilets" (DBPTs). DBPTs are an on-the-ground solution already at work; they provide revenue for the owners, sanitation for workers, and a semi-public space in the city. With Brenda, I made models of the toilet structures for the "Excrementa Estates" installation. In turning DBPTs into models of a kind routinely exhibited in client meetings or commercial sales events, similar to the ones made by Drew and Fry and Doxiadis, we sought to explore and question the role of the model in upholding regimes of power, expertise, and commerce.

Derived from a low place (latrines of Ashaiman) but presented in the mode of high architecture (clean white models with drawings and brochures), the models and the installation for Excrementa Estates are a cheeky attempt to insert existing alternatives into contemporary efforts by architects, urban planners, and anthropologists, among others, to design idealized solutions to poverty. DBPTs are a solution from a difficult place, a radical alternative that provides income, social mobility, and pride in providing what government and its hired architects cannot.

By borrowing the techniques and aesthetics of the architectural proposal, the models for Excrementa Estates—made miniature, stripped white, and affording the viewer a privileged, high point of view—are a critique of the legitimizing power normally held by the architect/expert. The models show radical public-private solutions designed and built by the citizens of Ashaiman in spite of neglect from expert agencies. The models are learning *from* Ashiaman rather than learning *of* Ashaiman, a shift in preposition and position. To go low instead of high may contain a powerful lesson for architecture and other forms of planning. ■

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BIBLIOGRAPHY

Bennett, Jane. 2010. *Vibrant Matter: A Political Ecology of Things.* Durham, NC: Duke University Press.

Provoost, Michelle. 2017a. *Tema Manhaen.* International New Town Institute. http://www.newtowninstitute.org/spip.php?article1088

———. 2017b. *Tema.* International New Town Institute. http://www.newtowninstitute.org/newtowndata/newtown.php?newtownId=121

Brenda Chalfin reflects on the use of design as a little development device.

the leader in upscale sanitary solutions?

I

In July 2016, I was invited to a conference on technology in Durban, South Africa, held over several days at a tourist lodge turned meeting venue (Mellon Foundation 2016). Shunning the redundancy of read-out-loud conference papers and PowerPoints, conference organizers sought nontraditional presentations. Because the purpose of the gathering was to ask questions about the conventions and limits of technology and infrastructure studies in Africa, a contribution that was in some way concrete seemed appropriate. I was in the middle of a fellowship year devoted to turning my field research in Ghana on popular solutions to urban sanitation into a book. I was awash in words: transcripts from the field, journal articles, and the written and rewritten words of my manuscript. I welcomed the opportunity to work in a format where the tight textual conventions of anthropology could be sidelined.

In collaboration with Xhulio Binjaku, a student architect at the Massachusetts Institute of Technology (MIT), I created an installation of architectural models and real estate brochures featuring the public toilets I encountered in the course of field research in urban Ghana. I initially conceived the installation as a type of interdisciplinary play, putting anthropology into new conversations and materials. Play soon became provocation as I jumbled commercial stylistics with ethnographic analysis and the jest that inevitably accompanies popular treatment of fecal matters with a critique of expert-derived development prescriptions.

This special issue of *Limn* provides an opportunity to share and critically reflect on the Durban installation and the concerns and design processes behind it. What happens when a vernacular "fix" never intended for objectification becomes a model subject to replication and circulation? Can such ad hoc infrastructural solutions be turned into "development devices" amenable to abstraction and adaptation to other times and places? Could and should consumer and class-based desires be used to guide the making and marketing of such templates for development and design?

II

With the aid of this trove of images, from among the many possible points of entry into urban planning and public life in Tema, I chose to go underground and trace the forms and logics of sanitary infrastructure. The sanitary underground, what urbanist Lewis Mumford (1961) called the "invisible city," was by all means a tangible, visceral component of urban experience in Tema, even if not fully knowable or entirely functional. Besides early sewerage plans, engineering specs, and logs of sewage volumes and system bottlenecks, there were complaint ledgers and tax schedules, and remnants of repair tenders and contracts.

Conducted over the course of a half-dozen visits to Ghana from 2010 to 2015, my fieldwork and archival studies showed a striking juxtaposition. Marking the aspirations of Ghana's newly won national independence, Tema at its founding in the late 1950s embodied the sanitary standards of Euro-American high modernity (Harvey 2003; Melosi 2001). This included

a citywide gravity-borne sewage system serving individual homes, each equipped with private water closets provisioned with identical imported fixtures. For more than 50 years, the original infrastructure remained in place. With heavy use, strained maintenance, and limited investment, the sanitary order I encountered a half-century later was in a state of grave disrepair. Reflecting Tema's expanding population and footprint, urban residents from an array of occupations and class strata had devised a range of alternative approaches to large-scale human waste management across the city, supplementing and substituting for municipal provisioning (Chalfin 2014, 2017).

Providing a forceful example of what Graham and Marvin (2001) call "splintering urbanism," distinguishing Ashaiman from other systems of sanitary self-provisioning, the city contains a vast array of what I label dwelling-based public toilets (DBPTs). These are not the conventional, standalone commercial toilets in places of public thoroughfare. Rather, as the accompanying models drawings and images demonstrate, the individuals who own and operate the toilets fully incorporate them into domestic and dwelling spaces despite the facilities' considerable sizes, with 8 to 20 seats and numerous technical entailments from water cisterns to large underground sewage holding tanks and sometimes biogas hook-ups. Most significant, situated within private residences by choice, these public sanitation systems are widely available to an otherwise underserved urban populace for a small fee per visit. In the face of gaps and lapses in state services, the designers *cum* proprietors of these vernacular infrastructures turn them into means of respectability and bodily relief for their customers, and a source of profit and public recognition for themselves.

III

Taken as a "type" all its own, Ashaiman's DBPTs offer a compelling alternative to both the modernist ideal of private toilets in private homes and the developmentalist reality of public toilets in public places for the unplumbed urban dweller. They equally depart from the emerging array of sanitary novelties devised by humanitarian donor designers, from the Without Water Closet and Urine Diversion Toilet to the neo-chamberpot Dignity Toilet or the biodegradable Eco-bag (Redfield and Robins 2016). Ashaiman's DBPTs instead represent what might be called a "fourth way" that innovates the possibilities of public toilet facilities and extant sanitary technologies. Those who devise and use Ashaiman's varied DBPTs, moreover, are unabashed in their embrace of conspicuous consumerism, status aspiration, and profit making. As lifestyle choices integral to the persons and communities the toilets serve, these DPBPTs mark a radical departure from the utilitarian aesthetics of humanitarian design as well as the private house–private toilet mantra of public health experts.

Selectively reassembled for this issue of *Limn*, Binjaku's and my contribution to the Durban conference showcased these realities in a site-specific installation titled "Excrementa Estates." It included three-dimensional architectural models, two-dimensional layouts and projections, and photograph-rich brochures detailing four of the more than 150 DBPTs currently in operation across Ashaiman. My foremost aim was to objectify what can be called "African solutions to African problems" by posing the promise of vernacular infrastructure for development design. With public health campaigns around the world driven by the United Nations Millennial Development Goals of eradicating open defecation (United Nations 2006), Ashaiman's DBPTs suggest a viable alternative. In sync with the social mores, living conditions, and incomes of the urban underclass, they are marked by wide availability, easy access, and relative affordability.

Ashaiman's DBPTs likewise represent a better option than the oft-noted ideal of home-based facilities exclusively for residential use. A bourgeois rendering of sanitary modernity not too different from that envisioned at Tema's founding, the World Health Organization and

the World Bank are still promoting this approach as the best sanitary model for the Global South (World Bank 2014). However, it has met with only limited success due to the difficulty and high upfront cost of installation across the vast number and variety of urban dwellings and the sheer impossibility of ensuring access for all. This is especially so in urban areas such as Ashaiman, where a large portion of the population is transient and permanent accommodation is never assured.

In the Durban installation, a slideshow juxtaposing Ashaiman's present-day sanitary realities with the original plans for the city of Tema accompanied the models, pamphlets, and posters of Excrementa Estates. Also included were images taken from recent promotional material from a new class of upscale planned communities in Ghana. In these neoliberal "New Towns," with names like Apollonia, Heaven's Gate, and Mirage, the promise of class mobility and domestic status symbols are key selling points. Featured in *Limn*, these ideals are deliberately reiterated in the illustrated brochures of Excrementa Estates, formatted to resemble popular real estate offerings. Though the dust and disarray of the booklets' snapshots of actual urban living contrast with the clean surfaces and air-brushed messaging of the real-life real estate marketing material, their impulse is largely the same. Affirming the project's plausibility, the advertising banner I printed in Ghana for the Durban event, reading, "Excrementa Estates: West Africa's Sanitary Frontier," was not considered out of the ordinary by the graphic designer who assisted with production and layout.

Highlighting the capitalization of property rights across the continent, the Durban conference was held at a small conference center and lodge located within a sprawling golf resort and residential development in the lush hills on the city's outskirts. In addition to accommodating meetings, the lodge hosted the resort's real estate sales. Its reception area included a plush, catalog-laden showroom containing house plans, price charts, and maps of the development's numerous subdivisions. Nearby, a modest meeting room was reserved for the installation. Stocked with drinks, snacks, pads, and pens, it was appointed with the same warm lighting and mahogany furniture as the showroom. Giving further credence to Excrementa Estates' resemblance to an actual real estate showcase, the architectural models were placed on the glass-topped table surrounded by their associated brochures. The large-format floorplans of the four structures were posted on the textured beige walls. These design elements helped convey a more serious point: the prime proponents of DBPTs will likely be upwardly mobile peri-urbanites with capital to invest in lucrative home-based enterprises. Class driven and profit based, though Ashaiman's DBPTs have the potential to raise the quality of life for the many, the installation seeks to make clear they cannot be separated from the economic success of the few.

Reiterated by the very context of display, instead of couching Ashaiman's sanitary prototypes in the guise of philanthropic good works, the installation marked the shared late-capitalist context of urban real estate development and humanitarian interventions. Attuned to these realities, the models and motifs of Excrementa Estates deliberately challenge the ethos of abjection that informs mainstream humanitarian design. Garnering awards for merging artistry and instrumentality, there is no doubt that many of the humanitarian devices that have emerged from the expansion of the development industry are marked by considerable elegance reflective of the modernist aesthetic of functional efficiency

BIBLIOGRAPHY

Agamben, Giorgio. 1998. *Homo Sacer: Sovereign Power and Bare Life.* Stanford, CA: Stanford University Press.

Amarteifio, Godfrey W., David A. Butcher, & David Whitman. 1966. *Tema Manhean: A Study of Resettlement* (No. 3). Kumasi, Ghana: Ghana Universities Press for the University of Science and Technology.

Bell, Bryan and Katie Wakeford. 2008. *Expanding Architecture: Design as Activism.* Metropolis Books. New York.

Chalfin, Brenda. 2014. "Public Things, Excremental Politics, and the Infrastructure of Bare Life in Ghana's City of Tema." *American Ethnologist* 41(1):92–109.

———. 2017. "'Wastelandia': Infrastructure and the Commonwealth of Waste in Urban Ghana." *Ethnos Journal of Anthropology* 82(4):648–671.

Clifford, James, and George E. Marcus. 1986. *Writing Culture: The Poetics and Politics of Ethnography.* Berkeley, Los Angeles: University of California Press.

D'Auria, Viviana. 2010. "From Tropical Transitions to Ekistic Experimentation: Doxiadis Associates in Tema, Ghana." *Positions: On Modern Architecture and Urbanism/Histories and Theories* 1:40–63.

Geertz, Clifford. 1973. *The Interpretation of Cultures: Selected Essays* (Vol. 5019). New York: Basic Books.

Graham, Steve and Simon Marvin. 2001. *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition.* Abingdon, UK: Routledge.

(Bell and Wakeford 2008; Redfield 2012). Yet, focused on Agamben-esque (1998) "bare-life," humanitarianism by definition shuns gaudy excess, making little allowance for the superfluities of humor and pleasure, and, most of all, waste. Countering these principles of parsimony, the installation's imagery highlights built forms overflowing with life, registering desire, disgust, shame, and delight.

IV

As an exercise in the nascent field of design anthropology, an uneasy translation of disciplinary knowledge was required to put these elements in dialogue. There was the fundamental challenge of hands-on three-dimensional construction. I willingly outsourced the task to Xhulio Binjaku, an architecture student at MIT and a University of Florida graduate who was already knowledgeable about my research and well informed about architecture in Africa. As much an epistemological impasse as technical problem, the fact remained that model making is not part of the mainstream of cultural anthropology. Besides the well-known anthropological penchant for textuality and conventions of "writing culture" (Clifford and Marcus 2010), the very act of modeling—stripping a complex, historically determined form down to its bare essentials—is antithetical to anthropological investment in context and specificity. Whereas distillation of the core elements of a social formation for purposes of analysis and comparison is well accepted, reduction in the service of replication and transferability is not because it compromises the anthropological precepts of cultural relativism and historical specificity.

Despite these attractions, ethical questions loom large. Who gets to model? Who has the skill and authority to make and circulate models? Who gets to claim that something is worth modeling? Even more consequential is the question of to whom the models belong: Are the models themselves a form of intellectual property, or do they encapsulate the intellectual investments that stand behind them? Are they attributable to a single, deliberate author, or are the origins much more diffuse? In the face of a rising market for workable, replicable, and adaptable humanitarian devices and interventions, these are real concerns. For the models presented here, at the very least, we seek acknowledgment of their multiple sources: location, owner-operator, ethnographer, photographer, model-maker.

Also looming is the question of the very propositions these models encode. Although Ashaiman's DBPTs promote the satisfaction of basic bodily needs in the face of limited wealth and considerable government constraint, they differ substantially from the broader catalog of humanitarian solutions in terms of scale. As this issue of *Limn* well illustrates, humanitarian interventions increasingly center on the design and distribution of little devices. Along with the generic emergency tents and tarps, there is, however, a rising prevalence of prefabricated field hospitals and "out of the box" schoolrooms and feeding centers, with every element designed and detailed from top to bottom (UNICEF 2017). Between the penchant for "little" or "large," capitalist "excess" or modernist "parsimony," Excrementa Estates captures design possibilities that emerge through living. ∎

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Harvey, David. 2003. *Paris: Capital of Modernity.* Abingdon, UK: Routledge.

Mellon Foundation. 2016, University of Michigan and University of Witwatersrand Workshop on Technology in Africa, Durban, South Africa. July 11-14.

Melosi, Martin V. 2001. *The Sanitary City: Environmental Services in Urban America from Colonial Times to the Present.* Pittsburgh, PA: University of Pittsburgh Press.

Mumford, Lewis. 1961. *The City in History: Its Origins, Its Transformations, and Its Prospects* (Vol. 67). Boston, MA: Houghton Mifflin Harcourt.

Redfield, Peter. 2012. "Bioexpectations: Life Technologies as Humanitarian Goods." *Public Culture* 24(1):157–184.

Redfield, Peter and Steven Robins. 2016. "An Index of Waste: Humanitarian Design, 'Dignified Living' and the Politics of Infrastructure in Cape Town." *Anthropology Southern Africa* 39(2):145–162.‹ UNICEF. 2017. UNICEF *Innovation: Emergency Structures. https://www.unicef.org/innovation/innovation_81590.html*

United Nations. 2006. *Millennium Project. http://www.unmillenniumproject.org/goals/*

World Bank. 2014. *Water Supply and Sanitation: Sector Results Profile. http://www.worldbank.org/en/results/2013/04/12/water-sanitation-results-profile*

Solar basics

Jamie Cross explores how a solar-powered lamp became the go-to solution to Puerto Rico's energy crisis.

Powerpoint solar powered lantern.
PHOTO: JAMIE CROSS

"Photovoltaic (PV) panels make electricity when the sun shines on them. They do it quietly, simply, reliably (at last!) and if not cheaply, at least for less money than last year ... Watch a billion dollar industry being born, folks."
— The Essential Whole Earth Catalogue (1986)

A police officer walks next to damaged electrical installations in Guayama, Puerto Rico.
REUTERS/CARLOS GARCIA RAWLINS

IN SEPTEMBER 2017, after two Atlantic hurricanes made landfall, Puerto Rico's electricity grid collapsed. The lack of electrical power affected an estimated 3.4 million people. There was no electric lighting, mobile phone charging, air conditioning, or refrigeration—a shock for domestic consumers as well as for national health, communication, and food storage systems.

The devastation of Puerto Rico's energy infrastructure catalyzed debates about how to rebuild and reform the electricity grid. Champions of renewable energy saw the crisis as an opportunity to accelerate a green energy revolution across the Caribbean, rebuilding the grid's infrastructure around wind and solar power. U.S. billionaire Elon Musk offered to install battery storage technologies for renewable energy in what some described as philanthropy and others as disaster capitalism. Meanwhile, economic analysts and international consultants saw this as a chance to privatize a highly indebted electricity utility, the Puerto Rico Electric Power Authority, which had provided free electricity to municipalities and state-run companies since the 1940s. "The vultures are circling," activist and author Naomi Klein wrote, when "the business press reports that the only way for Puerto Rico to get the lights back on is to sell off its electricity utility."

Amid the debate—and with no alternative solution to the island's short-term power needs—international governments and aid agencies, church groups, and businesses began to ship thousands of solar-powered lamps into Puerto Rico.

The British government announced that its response to Hurricane Irma in Puerto Rico and the British Virgin Islands involved the distribution of 60 metric tons of aid, including nearly 3,000 shelter kits (like those described by Tom Scott Smith in this issue) and 4,990 solar lamps, which they estimated would provide light and power for more than 20,000 people. In New Mexico, one the largest grassroots environmental organizations in the United States, the Sierra Club, coordinated a shipment of 1,000 solar lamps. And in Chicago an emergency solar lighting company, LuminAID, matched pledges from members of the public with pledges from corporations to secure 25,000 additional solar lights and phone chargers for people across the Caribbean.

One of the most widely reported initiatives began in San Juan, Puerto Rico's capital city. An organizational behavior consultant messaged a solar entrepreneur, the co-founder of Solar Sister, which sells solar-powered lamps to people living in homes without electricity across rural Africa through networks of door-to-door female sales representatives. Together, these women established an international crowdfunding campaign, Light and Hope, with the aim of raising $100,000 from international donors to buy solar lamps for thousands of Puerto Ricans. Their campaign presented access to clean, artificial lighting as a basic need, essential for human well-being, and life without light as a cause of suffering, equivalent to that endured by people without shelter, food, water, or basic primary health care. "People have become deprived of the basic resources of light," they wrote. "In a basic emotional human state, light allows people to feel hope and see possibility, so those without light feel despair and extreme loneliness."

Solar lamps and technical support for the campaign were provided by d.light, a U.S. company that manufactures and markets solar

lighting products to people living without reliable electricity across the world. "Families in Puerto Rico desperately need power," the company wrote on Twitter. "Help us give them solar-powered light and phone charging."

LIGHT AND HOPE

How did the solar lamp become a self-evident solution to the ethical and practical problems that emerge in a humanitarian emergency like that facing Puerto Rico? During the last four decades, the catalog of photovoltaic appliances designed to do good in places with no or limited access to electricity has expanded exponentially. Alongside solar-powered water pumps, one now can find solar-powered desalination systems and water-purification kits; solar-powered medical packs, diagnostic devices, and vaccine refrigerators; solar-powered chargers, mobile phones, and routers. But among this burgeoning solar array, the simple solar lamp has become a 'minimal' technology for living (Redfield 2012). For people in diverse contexts—from concerned citizens witnessing the emergency in Puerto Rico from afar to professional aid workers in humanitarian institutions—the solar lamp has come to serve as a benchmark of whether or not people have access to the most basic level of clean, efficient energy deemed necessary for human life. How is this so? How did ideas about what constitutes a basic level of access to electrical power become equated with the solar lamp?

The solar lamp is a generic term for a small portable lighting system powered by a photovoltaic module of zero to 10 watts. When placed in sunlight, photons excite electrons in the module into higher states of energy, allowing them to act as charge carriers for electric current. The current is sufficient to charge an internal battery, allowing a bulb or light-emitting diode (LED) to be switched on in the dark. But open up these solar lamps, literally and figuratively, and there are other critical components at work. These include ideas about the ecological and humanitarian promise of solar technology, ideas about the capacity of a solar light to empower and emancipate, and ideas about electric lighting as a basic human need. Indeed, the brief history of the solar-powered lamp is a story about its evolving imagination as much as its technical development.

For the past five years, I have been following attempts to build markets for small, off-grid, solar-powered lighting devices across semi-electrified parts of rural India. In rural India, the solar lamp has a distinct "energo-politics" (Boyer 2014) married to market expansion and

Disassembled powerpoint solar powered lantern.
PHOTO: JAMIE CROSS

projects of governance, social, or moral reform. Here the solar lamp is an exemplary little development device that captures both the diminishing scale of development visions and their continued grandiosity of ambition. It expresses a concern for human wellbeing by targeting a minimal level of need for artificial illumination; it minimizes the role of state institutions in meeting this need through projects of rural electrification; and it makes a claim to universal utility. So what kinds of disjunctures, slippages, and continuities emerge as the same device is deployed in humanitarian emergencies, from earthquake relief in Nepal to refugee camps in Burkina Faso, Kenya, or post-hurricane Puerto Rico?

THE BOTTOM OF THE PYRAMID SOLAR LAMP

Two moments in the evolution of the solar lamp's design and material politics offer insight. In 2007, villages in the north Indian state of Uttar Pradesh became a test site for a new kind of solar lamp. Designed in California but manufactured and assembled entirely in China, these solar lamps used high-efficiency, white LEDs and were built to be durable and tamper-proof (in order to protect their patented circuitry) and to serve as an ultra-affordable replacement for kerosene lamps. They were designed by a team of Stanford University students, who co-founded d.light to manufacture and promote them. "We asked ourselves, 'What is the lowest-cost stepping stone that you can get out there at a scale that is meaningful?'" one of the co-founders, Sam Goldman, told me. "We told our board and raised money by telling people that we expect to reach 100 million people by 2020. That was our goal, and we intended to surpass that."

d.light's solar lamp was lauded as a vanguard technology by social investment funds and international development donors, who saw it as the cutting edge of "bottom of the pyramid" design and social innovation (Cross 2013). During the next decade, d.light became one of the world's largest off-grid solar companies, with its products available in petrol stations between Mombassa and Kampala thanks to a partnership with French petrochemical giant Total. The company's success inspired dozens of competitors, and today manufacturers of small-scale solar lighting devices compete for a share of niche off-grid energy markets across sub-Saharan Africa and South Asia.

These solar lamps have not been without their detractors. Some have argued that solar lamps are little more than an inadequate band-aid solution to bigger problems (see Peter Redfield on band-aids in this issue). In India, for example, prominent advocates of solar energy have treated the minimalist design and politics of these devices with derision, even disdain. The director of the Indian government's National Institute of Solar Energy, a national laboratory founded to support the development of solar technologies, could barely contain his disgust when I interviewed him in 2012. "All these American and China lights in the market are just toys! Garbage," he told me. "They just give out a tiny light. What can anybody do with that?"

Such arguments cleave to the promise that solar energy can meet all of a society's energy needs. One high-profile Indian solar advocate and entrepreneur, Harish Hande, has been even more vociferous. For him the solar lamp fails because it does nothing to generate income or create wealth. "People think that sustainability is just selling a so-called solar product," he told me. "But replacing the total amount that poor people spend on kerosene and candles with spending on small lights that will last from six months to one year does nothing to change the cycle of consumer spending."

To the public, such concerns may appear to have little traction, perhaps because they fail to grasp the register in which small, solar-powered lighting devices are marketed or their claims to a minimal kind of intervention in contexts of failure or crisis. But the off-grid solar industry—solar manufacturers, distributors, and a trade body, the Global Off-Grid Lighting Association—have responded to such criticisms by managing their legitimacy, shifting the debate away from whether solar-powered light is a public good or whether people should be buying solar-powered lamps to the quality of the products themselves.

During the past decade, the growth of the off-grid solar industry has been accompanied by new solar lamp product standards—themselves a market infrastructure (Bowker and Star 2000). These product standards have created new distinctions between models and manufacturers. They also have refocused the question of whether a low-cost solar lamp is an appropriate solution to energy poverty, infrastructural failure, and climate change to the question of whether individual solar lamp products meet minimum standards.

The development of solar lamp product standards has been led by the World Bank and the International Finance Corporation as part of a joint Lighting Global program aimed at improving access to clean, affordable lighting. The Lighting Global program has introduced minimum quality standards for luminosity or lighting

output, durability, battery performance, and consumer warranties (though not reparability or sustainable design) against which solar lamps could be evaluated, as well as network of testing facilities in the United States, Germany, India, Kenya, and China. These standards have been adopted by a number of governments and institutions, from the Kenya Bureau of Standards to Nepal's Alternative Energy Promotion Centre, and in 2015 they became the basis for the International Electrotechnical Commission's proposed recommendations for the procurement and purchase of portable solar photovoltaic lamps, which are used by U.N. agencies, governments, and international development organizations.

By 2017, the small solar lamp was a mainstream consumer durable across sub-Saharan Africa and South Asia with annual sales of more than 22 million units. The majority of these solar lamps, however, do not meet the new international quality assurance standards. Recent trade figures estimate that only 29 percent of small solar lights sold globally have been certified under Lighting Global's Quality Assurance Program (World Bank/Dalberg 2018). Such figures point to considerable variation in the quality—luminosity, efficiency, and durability—as well as in the experience of electric lighting worldwide. They also suggest the market challenges facing U.S. and European solar lamp manufacturers such as d.light.

Like other kinds of little development devices (see, for example, Alice Street on the rapid diagnostic test in this issue) the success of the solar lamp also has hinged on the definition and redefinition of basic human need. During the past decade, policy makers from the World Bank, the International Finance Corporation, the International Energy Agency, international governments, experts from clean energy consortia, and international NGOs have been working to revise global indices of poverty specifically around energy under the auspices of the U.N.'s Sustainable Energy for All Initiative. One outcome of their activity has been a global framework for tracking progress towards the U.N.'s goal of universal access to sustainable energy by 2030. Under the framework, access to the most basic level of sustainable energy necessary for human well-being is defined as "corresponding to the level of supply and the level of electricity services that a solar lamp can provide."

This definition established the solar lamp as a global benchmark of whether basic needs for electricity are being met. It also has helped to make a humanitarian imperative of the

Solar lamp at night in the Goudoubo Refugee Camp Burkina Faso.
PHOTO: JAMIE CROSS

distribution of solar-powered lamps to people without electricity in contexts of emergency and crisis.

THE EMERGENCY SOLAR LAMP

Today, solar lamps are a ubiquitous part of the international emergency response to natural disasters, forced displacement, and disease epidemics. They can be found in the treatment kits distributed to medical practitioners in West African Ebola virus clinics, in the emergency packs distributed to people displaced by the Haitian and Nepalese earthquakes, and in the temporary settlements erected by the UNHCR to house people fleeing across international borders from violence in Mali and Syria.

These humanitarian emergencies are important moments for the off-grid solar industry. In them, the solar lamp is resolved as a humanitarian gift that can be given to end users rather than as a commodity to be sold to them. In 2015, for example, the U.S. humanitarian agency Mercy Corps added a Lighting Global-certified solar lamp to a "non-food relief kit" it distributed to families affected by the earthquakes in Nepal. For Mercy Corps' staff, the appropriate emergency response to the crisis was the free distribution of energy technologies, not the provision of low-cost solar devices through the extension

Solar panel charging in Goudoubo Refugee Camp Burkina Faso.

PHOTO: JAMIE CROSS

of micro-credit (see Jonathan Morduch in Limn #9). In the midst of humanitarian emergency, however, markets for goods are not erased, they are redefined around institutions and organizations, aid agencies, and charities. The gift of solar light lays the groundwork for future consumer markets.

Humanitarianism has become a core part of the off-grid solar business, with humanitarian emergencies creating important opportunities for brand-name recognition, partnerships with aid agencies and charities, and investment. As competition in the off-grid solar industry has increased, humanitarian agencies like Mercy Corps have become important institutional consumers for solar lighting companies that manufacture products to Lighting Global's quality assurance standards. As these companies find themselves undercut in consumer markets by lower-cost competitors, their partnerships with international organizations, charities, and humanitarian agencies become more important.

The employees of these companies work hard to win tenders and bulk purchase orders for solar products. When they respond to global humanitarian crises—moved by reports of suffering to get devices to those in need—they do so strategically. As they work through the numbers, they are also considering the implications

for their current inventory, future sales, and for their reputation. Six days after the 2010 earthquake in Haiti, for example, the World Bank, the Inter-American Development Bank, and the Global Environment Facility committed $3 million to an emergency program to provide "autonomous energy and light" using solar power. The World Bank took responsibility for procuring solar lamps and transporting them to Haiti for use in camps for displaced people, where it was hoped they would increase security and provide lighting that could address urgent post-disaster needs in Port au Prince and other affected areas. d.light won an early procurement contract and in the following year the World Bank purchased 40,000 of its solar lights as part of the relief effort.

In the aftermath of the Haiti earthquake, solar lamp manufacturers worked to sustain bulk purchase orders for their products among aid agencies and charities by helping these organizations secure grants for future procurement contracts. A year later, d.light advertised for a Haiti Market Development Fellow to help the company build more sustainable and scalable distribution for its portable lamps. The advertisement encouraged applicants who were both "passionate about improving the lives of people without electricity" and who had experience in business, specifically "sales, marketing and distribution." The job description described how the successful candidate would spend much of their time creating funding proposals and "fulfilling reporting requirements for grants" in order to help their partner organization "secure working capital funding from foundations in order to scale up their operations."

Converting such humanitarian partnerships into a sustainable business owes much, perhaps, to a company's marketing vision and initiative, as well as its prior positioning and connections. Five years later, d.light's products were such an established part of post-disaster humanitarian emergency responses that, in Nepal, they were Mercy Corps' preferred supplier.

In contrast, other off-grid solar companies have struggled. "Refugees are quite interesting for us," the sales manager for one off-grid solar lighting company told me last year in Ouagadougou, the capital of Burkina Faso. "If you think, one solar lamp per refugee and eight-, ten-, maybe 12,000 people in one camp ... well, that could be huge in terms of sales. The problem is, it's not recurring. It's just a one-shot sale."

The sale of solar lamps to humanitarians rather than directly to end users has presented solar-manufacturing companies with a familiar business challenge. Without the prospect of

agencies, charities, and international organizations stockpiling supplies of solar lamps—and without a reliable stream of crises—these markets are unpredictable and volatile, demanding new knowledge and expertise. In sub-Saharan Africa, one response has been to reimagine refugees and refugee camps as potential future markets for low-cost solar-powered devices. In an emerging field of "humanitarian energy," for example, researchers currently are seeking to establish the optimal pricing and aesthetic preferences of forcibly displaced communities in sub-Saharan Africa, with a view to expanding market opportunities for off-grid energy companies (e.g. Corbyn and Vianello 2018). Such efforts create important continuities between the arenas in which these devices are deployed as little development devices and those arenas in which they are deployed as humanitarian goods.

The role of solar-powered lighting in humanitarian emergencies has become an important part of the global solar industry's self-image, inseparable from its projections of future growth. For example, at an international trade fair hosted by the Global Off-Grid Lighting Association in 2015 in Dubai, plenary speakers were presented with a customary token of thanks. But rather than a bouquet of flowers or a wooden plaque each speaker was presented with "a gift of solar light" given not to them but on their behalf to displaced Syrians living in refugee camps on the edge of Europe. "We hope you agree," the trade association's chief executive told the audience, "that the best way to thank our speakers is by giving the gift of solar light to people who can't be part of the market at the moment but will hopefully become customers in the future." For the off-grid solar industry, it now appeared, access to the market and access to light were equivalent human needs.

The analyses and projections produced by economists, accountants, and marketing researchers for the off-grid solar industry have played an important role in shaping this market horizon. A recent report on market trends in the off-grid solar industry produced for the World Bank by Dalberg Advisors, a New York based development consultancy describes the chance that individual owners or users of solar lamps may become future customers as their "lifetime value potential." Aggregated sales data from off-grid solar companies and the industry's trade association allows analysts to show this potential by modeling individual consumer journeys from an entry-level, portable solar device like the solar lamp to larger, more expensive devices like a solar home system. As the report puts it,

"sophisticated, branded players have created an internal energy product ladder that not only caters to customers' differing willingness to pay, but also induces customers to migrate from basic to more feature-rich products over time" (World Bank/Dalberg 2018: 4). The possibility that the recipients of an emergency solar-lighting kit might become future consumers is creating powerful incentives for the off-grid solar industry, particularly in places like Puerto Rico where the future of a public energy utility hangs in the balance.

These two moments in the history of the solar lamp—the bottom of the pyramid light and the emergency light—suggest slippages between what we have described as development devices and humanitarian goods. The same solar-powered lamp can be deployed in a semi-electrified Indian village or a temporary settlement for people displaced by natural disaster. In one context, it is a technology designed to be sold direct to the end user; in another, it is designed to be sold to institutions, organizations, and charities. These contexts are more closely related than we might apprehend. As a little development device and a humanitarian good, the solar lamp meets a minimum basic need while opening pathways to new electric desires and aspirations. In both guises, the solar lamp is a stop gap that folds the promise of renewable energy into commitments to intellectual property and market growth, shaped by international product standards.

There are many solar-powered lamps. But within the off-grid solar industry the only solar lamps deemed capable of operating as either little development devices or as humanitarian goods are those products that have been certified in accordance with what are now international standards. It is not just their material parts that this process legitimates but their ethical credentials: their claims to care, to transform lives, and to meet basic human need. From the point of view of the off-grid solar industry, only certified solar lamps are inscribed with the qualities that allow them to do good. The rest are bare commodities.

FAKE LAMPS

This distinction played out in the wake of Hurricane Maria as the first shipments of solar-powered lamps to Puerto Rico were distributed. A month after the hurricanes hit Puerto Rico, President Donald Trump made a four-day visit. He toured the main island and visited sites of reconstruction. In the capital city, San Juan, the president stopped at the Calvary Chapel, an evangelical church with strong ties to the

Tweets from d.light.

mainland. Journalists photographed Trump distributing aid supplies, including solar-powered lamps. These were some of the 2,200 lamps that had been donated by a U.S. based nonprofit called Watts of Love. "Flashlights, you don't need them anymore," the president reportedly said as he handed the solar lamps to people in the crowd, reiterating the dominant message of his visit, that Puerto Rico was making a miraculous recovery and that the island would soon be back on the grid.

But the Watts of Love solar lamps were not the same as the those distributed by the U.K. government or the Light is Hope campaign. These lamps had not been certified by the Lighting Global standards authority. They were what the off-grid solar industry calls fakes.

As photographs of Trump's moment with the solar lamps circulated online, d.light was quick to respond. In the midst of Puerto Rico's energy crisis, the greatest challenge to the standard solar lamp's capacity to meet humanitarian need appeared to be the circulation of competing products. "Hi @realDonaldTrump," the company posted on Twitter, "love your support of solar and Puerto Rico, but that product is a Chinese counterfeit. ... How about suggesting people contribute REAL DEAL d.light products to Puerto Ricans in need?" ◼

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BIBLIOGRAPHY

Bowker, Geoffrey C. and Susan Leigh Star. 2000. *Sorting Things Out: Classification and its Consequences.* Cambridge: MIT Press.

Boyer, Dominic. 2014. "Energopower: An Introduction." *Anthropological Quarterly,* 87(2): 309–333.

Corbyn, Drew and Mattia Vianello. 2018. "Prices, Products, and Priorities: Meeting Refugees' Energy Needs in Burkina Faso and Kenya." *The Royal Institute for International Affairs' Moving Energy Initiative.* https://mei.chathamhouse.org/prices-products-priorities

Cross, Jamie. 2013. "The 100th object: Solar lighting technology and humanitarian goods." *Journal of Material Culture,* 18(4), pp.367–387.

Redfield, P. 2012. "Bioexpectations : Life Technologies as Humanitarian Goods." *Public Culture* 24, 157–184.

World Bank/Dalberg. 2018. "The 2018 Off-Grid Solar Market Trends Report." *International Finance Corporation.* http://sun-connect-news.org/fileadmin/DATEIEN/Dateien/New/2018_Off_Grid_Solar_Market_Trends_Report_Full.pdf

U.N. *Sustainable Energy for All.* 2013. "Global Tracking Framework." http://gtf.esmap.org/downloads

DEEP

ALICE STREET EXAMINES THE MARKET INFRASTRUCTURE BEHIND OFF-GRID DIAGNOSTICS

DIAGNOSTICS

THE WOMEN WAITED ON THE PRICKLY GRASS, THEIR babies hanging from nearby trees in brightly colored string bags, too-quiet children on their laps. One by one they ascended the veranda steps to the blue Formica table, where the nurse asked them the questions they had heard many times before. "*Skin hat?*," "*kai kai?*," "*Pek pek wara?*" "*Kus?*" Do they have a fever? Have they eaten? Do they have loose stools? Do they have a cough? The women sat rigid on the hard bench and whispered barely audible replies. A thermometer was placed delicately under an

armpit. The nurse listened to a child's breathing with a stethoscope. A clinic book detailing a child's previous visits to the clinic was cursorily examined.

What were the options here? Pneumonia, malaria, diarrhea, hopefully not tuberculosis. The nurse was so familiar with the symptoms and the treatment possibilities that she rarely opened the small standard treatment book that sat on the neatly organized table next to her. Most of the children were given antimalarials (chloroquine with Fansidar), antibiotics

(amoxicillin) and panadol. The mothers of the very sick ones (*bikpela sik*) were asked to come back if their child did not improve. They walked away in the blinding sun, carrying their children in their arms and their babies, parceled in their woven string bags, on their heads.

In 2004, when I visited Begasin Health Centre in Usino Bundi district, Papua New Guinea, diagnosis at a rural health clinic meant aligning a patient's symptoms with available treatments. Some rudimentary diagnostic tools were available: a stethoscope, a thermometer, a sphygmomanometer. But most community health workers and nurses depended on a combination of clinical judgment and syndromic algorithms from standard treatment books to undertake what medical practitioners call "empirical diagnosis." When the prescribed treatment did not work and patients returned to the health center sicker than when they had left, the health

development agency or NGO—but no one knew how long it had been there or how to use it, and no one had the key to the wooden cabinet in which it was kept. Inside the clinic, a surplus box of microscope slides propped the window open, providing welcome ventilation to the humid, tin-roofed room.

The routine medical protocols I observed on the verandah of Begasin Health Centre in 2004 were a far remove from laboratory-based gold standards for medical diagnosis, yet they did comply with the standards for rural primary health care in low and middle-income countries. At the time, the WHO recommended that anyone presenting with fever in a malaria-endemic area with no access to microscopy services should be treated presumptively with anti-malarials. Empirical diagnosis based on clinical judgement was considered the only way for curative medicine to proceed in places
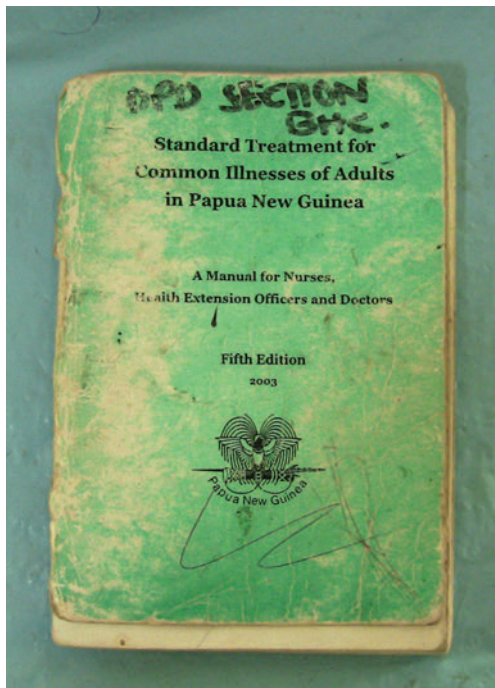
workers would scour the standard treatment book for other possibilities: tuberculosis, meningitis, dengue. There was no laboratory here, no way to test for these diseases, and very sick patients were referred to the general hospital in the coastal capital, several hours walk and a long bus journey away.

There was a microscope at Begasin Health Centre—possibly a remainder from earlier attempts to extend microscopy services into rural areas, or perhaps a one-off donation from a

where a lack of technical and transportation infrastructure and expertise precluded the extension of laboratory services.

Yet even as I observed the routine dispensing of antibiotics and antimalarials at Begasn Health Centre, elsewhere the norms for basic care in resource-limited settings were changing. Growing antimicrobial resistance to first-line drugs, such as those for malaria and tuberculosis, and the heightened cost of new drugs were drawing attention to the human and economic

cost of empirical diagnosis and the overtreatment it generates. Nonetheless, the technology and expertise necessary for more accurate laboratory diagnosis simply wasn't present in primary health care settings in many low- and middle-income countries, where the transportation, electrification, communication, and sanitation infrastructure that laboratories depend on did not reach.

Malaria rapid diagnostic test kits were transportable to places with limited road access. They compressed the time between test and result and therefore reduced the risk of losing patients to follow-up. They were affordable (with prices at around $1-$2 per testing kit) and easy to use, meaning they did not require a laboratory technician to read them. MRDTs extended the reach of laboratory medicine in two directions. First, they revealed the presence of pathogens hidden deep in the recesses of the diseased body. Second, they were designed to penetrate the farthest edges of the health system. Global health had entered the age of deep diagnostics.

PUBLIC NEEDS, PRIVATE GOODS

The excitement that surrounded point-of-care diagnostic devices following the arrival of the MRDT turned on their potential to make the physical extension of laboratory infrastructure unnecessary. But the shift from laboratory to test also brought a wholly different—and equally problematic—infrastructure into view: the market.

The development of MRDTs through biotechnology brought the absence of comparable point-of-care testing devices for other treatable infectious diseases in low-income countries into sharp relief and spurred demands for their development. In 2006, for example, Médecins Sans Frontières (MSF) marked World TB day by calling for the "urgent need for 'a simple test which yields results almost instantly and can be used by any laboratory technician, nurse or health workers even when far away from a laboratory.'" Campaign groups and public health experts made similar calls for diagnostics for neglected tropical diseases, such as trypanosomiasis and visceral leishmaniosis. Diagnostic devices are commodities, and their nonexistence was explained through the frame of market failure. The WHO focused on disincentives for industry to invest in the technology, including prohibitive R&D costs, a lack of regulation, uncertainty about market size, and concern about the ability of governments to pay for tests (AMS 2009: 9; WHO 2006). They discussed the need "to stimulate and facilitate the diagnostics industry to adapt available technologies to
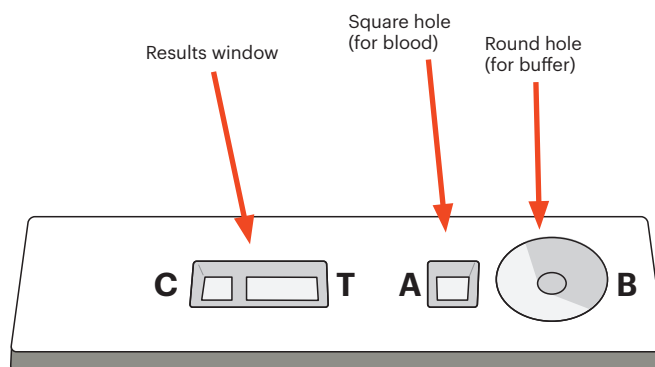
Malaria Rapid Diagnostics Test Kit

develop new diagnostics" (WHO 1998:2), and to call for partnership and engagement between the public sector and industry. In 1997, in an innovative move, the WHO organized a joint convention with industry to identify feasible TB tests for development. The premise of the convention was that public health experts could identify the tests that were needed, while industry representatives could help identify those that were most feasible (WHO 1997).

Emphasis on partnership gained momentum in the early 2000s, when the Bill and Melinda Gates Foundation entered the fray, adding diagnostics to its focus on drugs and vaccines within its mission to find technical solutions to global health challenges. The Gates Foundation already had invested in the establishment of novel public-private partnership arrangements for the development of life-saving drugs (DNDi) and vaccines (Gavi). In 2003, they donated $30 million to establish FIND, a nonprofit organization based in Geneva, and often referred to as a "product development partnership," with a remit of helping promising diagnostic developers to overcome development, regulatory, and market challenges. They also gave significant sums to PATH, a Seattle based nonprofit that develops new diagnostic tests, undertakes market research, and builds partnerships with industrial manufacturers.

By the middle of the decade, the global health community widely accepted that "strategic efforts to build laboratory capacity must be pursued urgently by partnerships between public (national and international), private and commercial sectors to address this health care crisis" (Petti et al. 2006: 380). With the articulation of a need for diagnosis segueing into the need for point-of-care diagnostics, work to improve the diagnosis of treatable diseases in resource-limited settings became concomitant with the work of "stimulating" and "shaping" markets for global health. These efforts to

incentivize diagnostic development led to the creation of a whole array of market-making techniques, methods and devices, designed to align the necessary with the feasible, which are ancillary to the diagnostic device itself.

MARKET DEVICES

So the world needs diagnostics—but which diagnostics? Not only are there multiple candidate diseases for which diagnostics might be developed, there are also multiple possible ways to test for any single disease, from rapid antigen-based assays to molecular-level PCR. Depending on where a test is embedded in a patient care pathway, its infrastructural requirements, what kind of sample is obtained and how (fingerprick, intra-venous blood, saliva, vaginal swab, sputum, urine), and what the test seeks to detect (antigens, antibodies, biomarkers, pathogens) all determine what kind of information a test generates, how accurate that information is, and what can be done with it.

For example, a simple, affordable and easy-to-use test for tuberculosis with high sensitivity (ability to capture positive cases) and low specificity (ability to exclude negative cases) could be used at a peripheral health care setting to triage patients but not to make treatment decisions. Positive cases would need to be sent for confirmatory testing to ensure people are not treated with highly toxic drugs unnecessarily. A point-of-care non-sputum-based biomarker test with high sensitivity and specificity may enable positive diagnosis, but will not necessarily enlighten health workers about drug resistance or susceptibility.

For every disease, a multitude of tests with different performance characteristics are possible. How should diagnostic developers decide in which tests to invest their time and resources? Market logic demands that, if investors are going to invest in diagnostics, and developers are going to embark on lengthy R&D programs, they need to know there will be demand for the end product. Identifying which tests are "needed"—and therefore which tests future customers (bilateral agencies, philanthropic foundations such as the Clinton Foundation, and international organizations such as the Global Fund) are most likely to buy—has therefore become a crucial step in fostering markets for diagnostic devices.

A range of market-making techniques, methods, and devices has been developed or borrowed to help define diagnostic needs and align them with industry-led solutions. Here are three of them:

1. Forecasting

In 2004, in collaboration with the RAND corporation, the Gates Foundation established the Global Diagnostics Forum, an interdisciplinary research group with the goal of identifying which diagnostic tests are likely to have the most health impact and to stimulate interest in such tests among the global health community. As Deborah C.Hay Burgess explained in the forum's subsequent special supplement of *Nature*, "An initial step in developing a rational strategy for creating diagnostic technologies for global health is to determine the need for, and the health impact of, potential new tests" (Hay Burgess et al. 2006: 2).

The forum used mathematical modeling techniques to predict the impact (measured in lives saved and disability-adjusted life years [DALYS]) for hypothetical tests in six disease areas (acute lower-respiratory infections, HIV/AIDS, diarrheal diseases, malaria, tuberculosis, and sexually transmitted infections). The GDF models quantified the difference between the status quo—in which empirical diagnosis is the norm in peripheral areas—and a future populated with rapid point-of-care tests.

The chief finding was that higher-accuracy tests, requiring more advanced infrastructure, would have a lower overall impact on disease burden than less-accurate tests that could be used in more peripheral facilities and therefore reach a greater number of people. For instance, a syphilis test requiring minimal laboratory infrastructure was calculated to prevent more than 138,000 congenital syphilis cases and more than 148,000 stillbirths annually. A test that could be performed with no laboratory infrastructure could prevent more than 201,000 congenital syphilis cases and 215,000 stillbirths annually (Urdea et al. 2006: 75; Keeler et al. 2006). Deeper penetration of the health system trumped the scientific penetration of biological matter. The impact of point-of-care diagnostic tests could be greater than that of gold-standard laboratory testing, so long as they were ambitiously distributed.

The scientific calculations that the GDF put forward made a forceful case for global health funders to invest in the development and procurement of rapid, portable, point-of-care diagnostic devices. Yet for all their apparent numerical objectivity, the GDF forecasts also depended on the construction of a compelling story about what global health "impact" looks like.

First, the GDF focused on the potential for point-of-care diagnostics to bring about some improvement, however minimal, for

populations with inadequate access to diagnostic technologies: "We consider a new test to represent an improvement if it saves more adjusted lives than would be saved in the status quo" (Girosi et al. 2006: 6). This humanitarian calculus side-stepped tricky ethical questions about global health inequity, including whether it is acceptable for patients at peripheral facilities in low- and middle-income countries (LMICs) to receive a less-accurate diagnostic test than patients with access to laboratory services in wealthier countries or regions (see also Moran, this issue).

Second, the GDF forecasts implicitly abandoned older visions of large-scale infrastructure development, accepting that the electrification and transportation infrastructures necessary for laboratories were unlikely to be extended uniformly across LMICs. In the GDF forecasts, the health centers where point-of-care tests were used would all remain disconnected from centralized electrification, transportation, sanitation, and communication infrastructures into the future. This was acknowledged in an aside made in one of the publications resulting from the project:

> *Although it is outside the scope of this paper, another method for improving health outcomes that could be approached in parallel to improving diagnostic tests would be enhancing the infrastructure and staffing available at these health-care settings. This approach would, in turn, allow the facilities to adopt better tests that might be available today or in the future. For instance, improving infrastructure and staffing could allow nucleic-acid-based tests for STIs to be adopted in more health-care settings"* (Girosi et al., 2006: 8).

The GDF forecasts included calculations about the likely availability and success of treatment at different levels of health facility in different countries, but tenuous links between diagnostic test and treatment were, for the most part, glossed over. For example, the forecasts made no mention of the complexities of rolling out smooth medical supply systems, health-worker training, and treatment protocols in health settings lacking basic infrastructure. As critical global health scholars have shown, whether a test is used, how it is interpreted, and how it is acted on each depend on local institutional histories, relationships and expectations (e.g. Beisel et al. 2016; Chandler et al. 2011). The conflation of test availability with treatment created the impression that diagnostic devices have a direct impact on disease itself, occluding the many contingent steps in the diagnostic process, and focusing attention on the device itself as a worthy investment for global health funders.

Last, the GDF forecasts generated a vision of universal access to point-of-care testing that was, in some respects, no less grand than older developmental schemes. This was a vision in which there are tests for everything and tests everywhere. These tests would not be as accurate as laboratory tests that require carefully calibrated machines, refrigerated reagents, and highly trained technicians, but through sheer ubiquity they would save more lives than the best laboratory tests. This was a vision for a health infrastructure that is modest in quality but ambitious in reach.

Ultimately, the "success" of the GDF forecasts depended less on their scientific accuracy in predicting the future, than on their capacity to convince funders and developers that diagnostics have humanitarian, public health and economic value. The objective was to "articulate the acute need for diagnostic tools" and "encourage technology developers in the public and private sectors to do more to accelerate the development and delivery of new diagnostic solutions" (Hay Burgess et al. 2006: 2).

2. Consensus making
The GDF harnessed mathematical modeling techniques to evidence the need for specific diagnostics and incentivize funders and industry. However, time and again, the accuracy of mathematical forecasting has been shown to vary wildly. In 1967, the RAND Corporation published an influential paper outlining a new forecasting method, based on the generation of consensus among a community of experts. Ultimately, the paper stated, mathematical models are only as good as the experts who provide the input values, so why not make this dependence on experts explicit and refine the process? The solution outlined in that paper, called the Delphi method, was first developed to forecast the impact of technological change on warfare. It was underpinned by the idea that groups are better at predicting the future than individuals, and anonymity will encourage flexibility and safeguard against status-based influence. A questionnaire was sent out to selected experts in the field. Their answers were anonymously summarized by a facilitator, who laid out common and conflicting viewpoints and reasoning and asked participants to revise

their answers to the questionnaires in these responses. Over several rounds, the group was expected to move towards a consensus about what is most likely to happen.

Since the mid-20th century, the Delphi method has metamorphosed into a facilitation tool for the management of multi-stakeholder projects and is especially popular in global health. In the context of global diagnostics, it is not used to reconcile the predictions of different stakeholders, but to establish which futures—in the form of specific tests—are most desirable. In 2014, for example, the Global TB Programme of the World Health Organisation employed the Delphi method to identify priority diagnostic tests for tuberculosis (WHO 2014). The "experts" consulted in the Delphi Process included 24 participants from technical agencies and researchers (all but one based in the northern hemisphere); seven participants from funding organisations; five participants from supranational TB reference laboratories; five implementers and clinicians (all but one from institutions in the Northern hemisphere); and six representatives from countries with a high burden of TB. The process resulted in agreement on three diagnostic priorities: (i) a point-of care, biomarker-based, non-sputum-based test to detect TB; (ii) a point-of-care test that could be used for triage; (iii) a point-of-care sputum-based test that could be used as a replacement for smear microscopy. These were taken forward to a subsequent meeting with industry, where product profiles for the tests were agreed on.

The use of the Delphi method in this context raises questions about who is included and excluded from processes of defining global health needs. As one WHO representative put it to me, "The process works if you have the right experts." But who are the "right" experts? Some lines of exclusion were explicit: for example, WHO rules designed to safeguard against the influence of commercial interests dictated that industry representatives were excluded from the process. Others were more opaque: the group was dominated by academics and public-health professionals from funders and global health organizations based in Europe and North America. In an indication of the extent to which the process of identifying needs was driven by market logic, these experts were also key individuals likely to influence their organization's future procurement policies. Overall, out of 46 invited participants in the Delphi method, twelve were based at institutions in low- and middle-income countries with a high burden of tuberculosis.

3. Profiling

Needs must be met with solutions, and while it is sometimes deemed appropriate to exclude industry representatives from the definition of global health needs, their participation in the finding of solutions is presumed to be crucial if those solutions are going to be feasible. In 2014, following the use of the Delphi method to ascertain priority needs, the WHO hosted a meeting in Geneva where industry representatives were invited to help develop performance specifications (sensitivity, specificity, shelf life, infrastructure requirements, cost) for the priority tests. The final specifications were subsequently published in the form of four target product profiles (TPPs).

The TPP was a device originally designed by the FDA in the late 1990s to improve communication with the pharmaceutical industry during the drug-development process. Over the past decade, the TPP has found a new home among global health initiatives as a technique for reconciling needs with solutions, demand with supply. A TPP that has had input from funders, regulators, users, and industry not only describes a goal, in the form of a diagnostic test, but is intended to make its achievement more likely. TPPs, as one WHO representative explained to me, "are aspirational." They are guidance for the manufacturer on what kind of tests agencies are willing to procure. At the same time, the role of industry in defining those characteristics means they are more likely to be met.

At the 2014 meeting, the writing of TPPs involved negotiations between advocacy groups and industry over the correct pricing of the tests, and between users and industry about the kind of temperature stability that would be required. The TPP convention of recording "minimum" and "optimum" specifications for each of these items meant that some degree of difference between stakeholders could be tolerated in the final profile. The TPP brought the desirable within touching distance of the possible.

CONCLUSION

The arrival of the malaria rapid diagnostic test fundamentally changed ideas about what kind of medicine was feasible and desirable at the periphery. It became possible to imagine that microbes, parasites, or viruses, which are imperceptible to the human eye, could be identified in bodily fluids by a health worker with basic training in a health facility with no running water, electricity, or laboratory equipment. In changing what was technically possible, the rapid diagnostic test kit also transformed

expectations for everyday medicine in re-source-limited settings. The human cost of mis-diagnosis and unnecessary treatment, which previously had been accepted as the necessary cost of universal access to health care in places without a laboratory, now became an aberration demanding action.

The arrival of mobile point-of-care diagnostics also presaged a shift in the problematization of diagnosis in global health, from how to extend laboratory infrastructure to how to stimulate markets for mobile devices. Once the need for diagnosis in peripheral primary-care settings became commensurate with the need for diagnostic devices, the substantial problem-solving apparatus of global health institutions in Europe and the United States was focused on overcoming the challenge of market failure.

Ironically, given that the "need" for diagnostics in global health was framed as the motivation behind these activities, they also were aimed at specifying those needs. Once identified, needs also had to be articulated with feasible solutions—that is, small, portable, marketable diagnostic devices. The alignment of public needs with private solutions required a fine-tuned array of techniques, methods, and

devices that would align the desirable with the feasible at the same time as they kept public and private interests distinct. Whether this has had any impact on the care provided at Begasin Health Centre in Papua New Guinea is another story. ■

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BIBLIOGRAPHY

Academy of Medical Sciences. 2009. "Global health diagnostics: research, development and regulation. Workshop Report." https://acmedsci.ac.uk/file-download/34733-127607104184.pdf

Beisel, Uli.; René Umlauf; Eleanor Hutchinson; and Clare I.R. Chandler. 2016. "The complexities of simple technologies: Re-imagining the role of rapid diagnostic tests in malaria control efforts." *Malaria Journal*, *15*(1): 64.

Chandler, Clare I. R.; Rachel Hall-Clifford; Turinde Asaph; Magnussen Pascal; Siân Clarke; and Anthony K. Mbonye. 2011. "Introducing malaria rapid diagnostic tests at registered drug shops in Uganda: limitations of diagnostic testing in the reality of diagnosis. *Social Science & Medicine*, *72*(6): 937-44.

Girosi, Federico et al. 2006. "Developing and interpreting models to improve diagnostics in developing countries." *Nature*, *444*: 3-8.

Hay Burgess, Deborah C.; Jeffrey Wasserman; and Carol A. Dahl. 2006. "Global health diagnostics." *Nature*, *444*: 1-2.

Keeler, Emett.; Perkins, Mark D.; Small, Peter.; and Hanson, Christy. 2006. Reducing the global burden of tuberculosis: the contribution of improved diagnostics. *Nature*, *444*: 49-57

Petti, Cathy A., Polage, Christopher R., Quinn, Thomas C., Ronald, Allan R., & Sande, Merle A. 2006. Laboratory Medicine in Africa: A Barrier to Effective Health Care. *Clinical Infectious Diseases*, *42*(3): 377-382.

Urdea, Mickey et al. 2006. "Requirements for high impact diagnostics in the developing world." *Nature*, *444*: 73-79.

World Health Organization. 1997. Workshop report. "WHO tuberculosis diagnostics workshop: Product development guidelines." http://www.who.int/tdr/publications/documents/tuberculosis-diagnostics.pdf?ua=1

World Health Organization. 1998. "Global tuberculosis programme: The tuberculosis diagnostics initiative." http://apps.who.int/iris/bitstream/10665/64099/1/WHO_TB_98.249.pdf

World Health Organization. 2006. "Diagnostics for tuberculosis: Global demand and market potential." http://www.who.int/tdr/publications/documents/tbdi.pdf

World Health Organization. 2014. Meeting report. "High-priority target product profiles for new tuberculosis diagnostics: Report of a consensus meeting." http://www.who.int/tb/publications/tpp_report/en/

Jonathan Morduch traces the rise of microfinance, and argues that it's time for a new vision.

MICROFINANCE AS A CREDIT CARD?

Muhammad Yunus won the Nobel Peace Prize in 2006, the most prestigious of a string of awards celebrating his role in creating banks for the poor. If there was a Nobel for marketing, he could have won that, too. That's not meant as a jab but as recognition of Yunus's rhetorical flair. Yunus not only founded a financial institution that serves the poor in Bangladesh (Grameen Bank, the 2006 Nobel co-winner), he also crafted a global vision for funding entrepreneurs and tirelessly promoted it for three decades.

But today Yunus's vision — and the assumptions it rests on — is coming apart. Microfinance has proved fairly robust as a banking idea but not as an anti-poverty intervention.

Yunus's pitch for microfinance was designed to please donors and socially-driven entrepreneurs who might follow his lead. His pitch is simple, promises much, and asks little of donors and aid agencies. The focus is on loans that are funded mainly by borrowers'

Muhammad Yunus PHOTO: UNIVERSITY OF SALFORD PRESS OFFICE

interest payments. The microfinance loans, Yunus argues, fund small, under-capitalized businesses and thereby transform their ability to generate income. That accomplishment, he claims, can reduce poverty dramatically. In contrast to the targets of previous attempts to fix credit markets in low-income areas, the borrowers are mostly poor women, the loans are small (starting around $100), and repayments are made in manageable weekly installments over a year.

Microfinance is an unusual kind of "device." Most important, it's a set of financial services, not a tangible product. But the microfinance narrative is very much bound up with its "device-like" qualities: microfinance is tailored to meet a narrow, specific purpose; its presentation and delivery are standardized and easily replicable; it is sold in standard units without much customer support; and it is brought into communities without substantial adaptation to the local context. Ideally, context should matter more, but customization is costly. The device-like nature of microfinance permits lenders to expand quickly and slash costs.

Microfinance is device-like in another way. Many microfinance providers seek to earn profit and pay for their work through a fee-for-service business model. Microfinance institutions thus aim to operate independently of the state's purse and outside its purview. Unlike public social insurance programs that redistribute income, microfinance leaves poor people to find — and fund — their own ways out of poverty. Grameen Bank's success in Bangladesh — it now serves over 8 million customers — has been a model for similar entrepreneurial, market-friendly approaches to social problems, including private health clinics and ambulance services for the poor, private schools in slums, and a range of other interventions that graft do-good aspirations onto market models.

The pitch for microfinance hasn't been embraced by everyone. Some argue that poor adults need quality jobs, offering employee benefits and possibilities for promotion, not self-employment in tiny, self-managed businesses (Bateman and Chang 2012). The anthropologist James Ferguson argues that the rise of publicly-provided cash transfers holds far more interest than "paradigmatically neoliberal" interventions like microfinance (Ferguson 2015: 1). Empirically-minded academics (who may have started with high hopes for microfinance) also

point to evidence from independent research that fails to find clear causal impacts of microfinance on business growth or poverty reduction for most customers. Aid agencies and foundations have been left feeling confused, disappointed, and perhaps betrayed — and have started moving on (Mossman 2015).

But too quickly dismissing microfinance as a "sort of neoliberal predation" (Ferguson 2015: 2) or as a poor substitute for social insurance or alternative income-generating interventions fails to get at the root of microfinance as practiced. So does outright rejection based on econometric studies of hard-to-find causal impacts on business outcomes. The arguments against microfinance may be correct on the surface, but they fail to get at what microfinance actually is and how it really works.

Although microfinance has failed relative to its boldest claims, it has not failed unconditionally. In fact, microfinance has been a wild, improbable, impressive success in important ways. Microfinance grew fast in Bangladesh, serving women whose families live on incomes that are low, if not among the country's very poorest, and the broader movement inspired by Yunus and his fellow pioneers now serves more than 200 million people globally. Each week, microfinance institutions bring reliable financial services to citizens who otherwise would be ignored and excluded by traditional banks.

We are then left with a puzzle. Why do so many millions of people want microfinance if it fails to deliver on its promises?

The problem is not with its device-ness but with its portrayal. The practice of microfinance is distinct from the narrative that Yunus created to promote it. Microfinance customers have re-imagined what the financial services can do and why they need them. Customers divert microfinance loans from businesses and instead use them to spend on other priorities. By doing that, borrowers provide an alternative view of their real needs (and an alternative view of microfinance's possibilities). Researchers have tested Yunus's narrative of entrepreneurial transformation and found it wanting, but the tests are too narrow because Yunus's narrative is too narrow.

WASHINGTON, D.C. 1986

To unspool Yunus's vision and explore alternatives, it is helpful to go back to the 1980s when the modern incarnation of microfinance first emerged on the global scene. Transcripts from congressional hearings about foreign assistance provide a useful record of early public conversations in the United States. In February 1986, for example, Rep. Stan Lundine of New York convened a joint meeting of the House Select Committee on Hunger together with a subcommittee of the Committee on Banking, Finance and Urban Affairs. The hearing took place in a high-ceilinged, wood-paneled chamber within the maze of the Rayburn House Office Building, the block-sized office complex flanking the U.S. Capitol. The topic was "Microenterprise credit" — not yet shortened to "microcredit" — and Yunus was the featured guest. At the time, he was a little-known Bangladeshi economist who, three years before, had received a special license to create Grameen Bank. The Ford Foundation, an early backer, paid to bring Yunus to Washington.

When international development was on the agenda, the usual focus was on government-to-government foreign assistance, but Doug Bereuter, a moderate Republican from Nebraska, started the meeting by noting that this was an unusual event. "Some may find it strange," Bereuter began, "that two congressional committees are meeting to discuss such things as news-vendor cooperatives in the Dominican Republic ... or a sandal maker in Dacca [sic]. But perhaps it may not sound so esoteric when one realizes that one-half to three-quarters of the developing world's population consists of underemployed people working in the so-called informal sector." It was this population — systematically excluded from the banking sector and limited in their access to working capital — that Yunus sought to serve. He explained to representatives that banks "refuse to open their doors to the poor people who cannot provide collateral" and that "giving money to the poor is not their cup of tea" (U.S. House of Representatives: 4)

Yunus relayed his own story to the assembled legislators, starting with the "frustrations after frustrations" that befell Bangladesh after independence in 1971. Yunus was an economics professor at Chittagong University on Bangladesh's southern coast when in 1974 the country experienced a deep famine. Yunus set out to create an informal economic study, taking his students to a nearby village to learn about the villagers' lives and needs. Yunus concluded that the villagers' business problems were fundamentally credit problems:

One of the things which struck me, was that it is very hard for people to make a living, because the circumstances and environment do not support their income-generating endeavors.

One woman I met in that village near Chittagong University was working all day to make bamboo stools. At the end of the day she made only 2 pennies. My trained mind in economics could not accept the propoposition that one could work all day to build bamboo stools and make only 2 pennies.

On closer scrutiny, I found that it is because she did not have the small amount of money to buy the bamboo to make the bamboo stool, so she borrowed the money from the trader who will buy the final product, the bamboo stool, from her. As a result, the trader dictated the price, which barely equaled the cost of the raw materials.

So, it came to my mind that I should make a list of such persons in that particular village who were borrowing from the trader just to

FIGURE 1.
The Return to Capital
(Case 1: Diminishing marginal returns to capital).
Entrepreneurs who start
with little capital generate
far more additional profit
than those who start with
more capital.
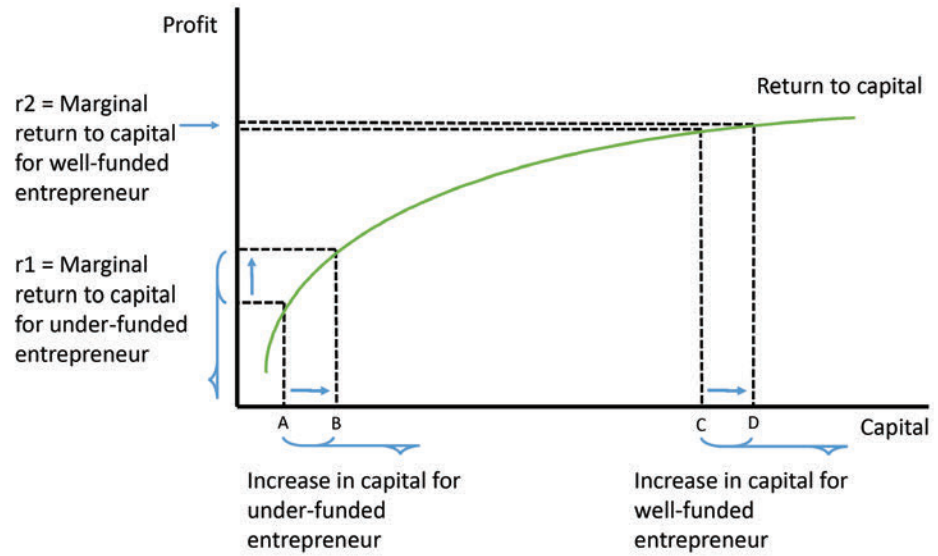
make things and make a living for themselves and how much money they are borrowing from the trader.

I had a student of mine with me and we prepared a list of 42 such persons. The total amount they borrowed from the traders, different traders, totaled 856 taka, which is barely a total amount of $26. I felt extremely ashamed of myself being part of a society which could not provide $26 to 42 able, skilled human beings who were trying to make a living.

(U.S. House of Representatives: 4)

Yunus's impulse was humanitarian and focused on the villagers' immediate burdens. These early observations suggested to Yunus the possibility of a kind of emancipation. The stool-maker would gain freedom from the middleman's usurious loans. The rickshaw puller could buy his own rickshaw and avoid handing over the bulk of his earnings as rent for the vehicle.

The story holds power — but only under strong assumptions. Stripped to its essence, the story constructs a narrow view of the poor as fundamentally entrepreneurs (or would-be entrepreneurs) with pent-up productive power, held back only by the lack of capital. What is left unsaid and unexamined is the possibility that some villagers instead see themselves as would-be employees rather than would-be entrepreneurs — and they might then benefit most from the introduction of

a large employer with the capacity to offer steady employment. Nor is there recognition of a failure in the goods market that might instead be met by increasing competition for monopolist middlemen. Nor is there recognition here that financial tools are necessary to facilitate spending, not just fund investment.[1]

The view of microfinance underlying Yunus's depiction often is defended using a version of the idea (if not the language) of diminishing marginal returns to capital, an Economics 101 mainstay. The idea as applied to microfinance has the pleasure of being simultaneously intuitive and counterintuitive. The main idea (see fig. 1) is that the first increments of capital obtained by a business will generate the largest gains in profit. These are the loans that support an entrepreneur's best, most-underfunded ideas. As a business acquires more capital, entrepreneurs move to their next-best ideas, then their next-next-best ideas, and so on. This part proceeds as logic.

The counter-intuitive part springs from the next step: the simplified story results in starved-for-capital micro-enterprises served by Grameen Bank generating far higher profit ($r1$) from a given investment (an increase from A to B in fig. 1) than do the larger, established businesses served by traditional banks. The gain in profit for entrepreneurs that are already well-funded is just $r2$ when their capital increases by the same amount (i.e., an increase from C to D).

Rep. Lundine captured this notion in remarks at the

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1 Grameen Bank eventually created loan products to support a limited range of spending needs, especially for major housing and education costs. Their main loan product, though, has always been described as a business loan, despite evidence that it is often used in broader ways.
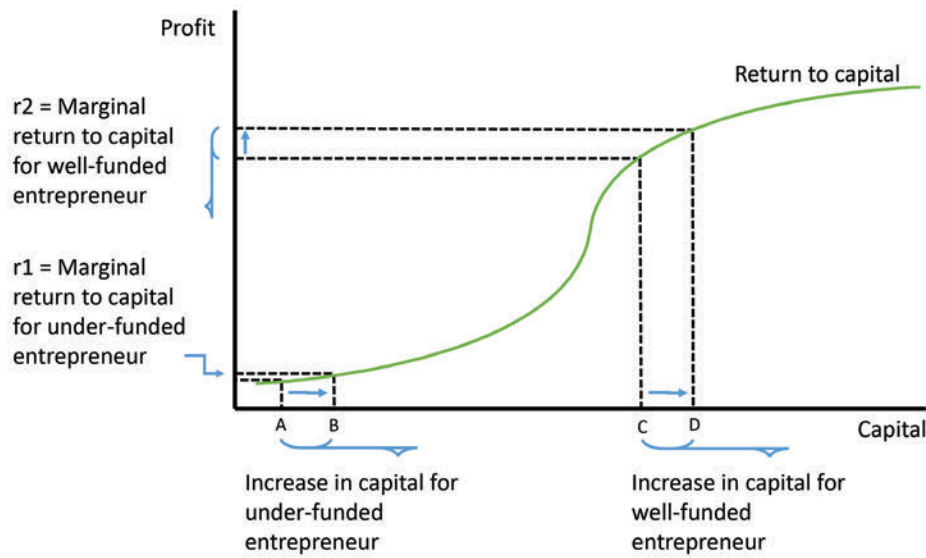
FIGURE 2. The Return to Capital (Case 2: Returns to Scale in Capital Investment). Entrepreneurs who start with little capital generate less additional profit than those who start with more capital.

hearing, as he described the dynamism of the "microentrepreneurs" served by Grameen Bank:

> *Microentrepreneurs very much represent the private sector in developing countries. In fact, it is this segment of the private economy in these countries which is the most dynamic and which represents the greatest potential for economic growth. Economic growth from the bottom up benefits precisely those who have the greatest need and therefore the most to gain, the poorest of the poor.*
>
> (U.S. House of Representatives: 1–2).

The assumption that poor microentrepreneurs have the "greatest potential for economic growth" also means, according to the logic, that the poor can pay high interest rates and still come out ahead. In fact, they can pay far higher interest rates than larger businesses (since r1 >> r2). Assumptions are thus inverted: The poor can pay more *because* they are poor and excluded. The poor can profit more *because* they are poor.

In short, Yunus's story implies that if you can find a way to reach the poor, their gains (and the bank's gains) can be high. Yunus reported to the legislators that Grameen Bank had grown steadily, earned profit for the past two years, and recovered loans at a rate "near 99 percent."[2] Yunus's contribution was to find a way to reach the poor cheaply enough that revenue from

interest could cover the costs. Grameen Bank did that by serving villagers at group meetings and having the villagers themselves play a role in monitoring each other and determining creditworthiness (Cull et al. 2018).

The cost-cutting part of Yunus's depiction increasingly was relevant to its success. By the time of Yunus's visit to Congress in 1986, the IMF and World Bank were preoccupied by the fiscal imbalances in developing economies, which ultimately pushed the IMF and World Bank to force high-debt countries to cut budgets in order to service foreign debt, often by slashing social spending. In that light, it was unsurprising that Representative Bereuter highlighted that support of microcredit was inexpensive for donors (especially relative to building bridges and railways). In almost poetic terms — "given today's budgetary reticence" — Bereuter had noted that "the large drop in new investments in the developing world" made "small credits to viable microbusinesses seem to be an optimal way to generate new income and jobs" (U.S. House of Representatives 1986). Microcredit thus also had the advantage of seeming like a cheap way to do something for the poor. The donors only were called upon to provide startup funding and basic infrastructure.

Another poetic contrivance created an additional reason for turning to microfinance: the rathole. This metaphor was invoked most famously in the 1990s by Sen. Jesse Helms, a Republican from North Carolina and chairman of the Senate Foreign Relations Committee, to

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2   Grameen Bank's achievements are impressive, but claims about profits and loan recoveries are overstated when viewed from the perspective of generally-accepted accounting principles; instead, my calculations show that Grameen was reliant on subsidy from the start (Armendàriz and Morduch 2010). For an updated view of the continuing dependence on subsidy in the broad microfinance industry, see Cull et al. (2018).

depict what he saw as a transfer of taxpayer funds overseas with seemingly little accountability and no clear metrics of impact. To Helms, foreign assistance mainly disappeared down "foreign ratholes" never to be seen again. But with microfinance the market promised to provide accountability. Surely customers wouldn't pay Grameen Bank for loans — with 16 percent interest at the start — if the services were not making a difference. Plus, surely the loans would not be repaid "nearly 99 percent" of the time if the money was being wasted. The market, hallowed in Reagan's 1980s, thus was positioned as both a delivery mechanism and an accountability guarantee. Evidence of sustained demand for microcredit and high repayment rates became the prime indicators of success. Other interventions, like public schools and hospitals or road projects, could not claim such easy metrics.

ALL ELSE IS NOT EQUAL

The world, though, doesn't necessarily look like figure 1. There are tradeoffs and complexities in practice and, like so much else in economics, the relationship captured by the simple textbook case requires that we assume *ceteris paribus* — "all else is held equal." The assumption is not trivial here. People who start with vastly different amounts of capital also are likely to be different in other ways. Poor entrepreneurs are less likely to have relevant skills and connections. The bamboo-stool maker probably is hindered by more than the lack of financial access. She also may lack the trade connections or marketing skills to sustain a scale of business necessary to reap large returns. The story changes dramatically (see fig. 2) when the analysis is expanded to take into account how economies of scale can matter. Here, the poorest entrepreneurs (i.e., those in the left-most section increasing capital from A to B) generate little extra profit with a given increment of extra capital (for lack of scale and perhaps lack of other inputs beyond capital), while better-off entrepreneurs are positioned to reap the rewards of their size (as they increase capital from C to D). Here, $r_1 \ll r_2$. The poorer entrepreneurs in this second case are unable to profit much, unable to pay high interest rates, and need a lot more than capital if they are to materially move forward.

The assertion that village economies look more like figure 1 than figure 2 — i.e., that diminishing marginal returns is a more powerful effect than increasing returns to scale — set too high a bar for the expectations of microfinance impacts. A stack of statistical studies now shows that village economies are a mix and plenty of residents are in the figure 2 world, ill-prepared to gain much from petty business. For them, the notion of microcredit as a simple device, always capable of delivering impact on its own, falls away. Gone is Yunus's case that anyone can succeed in business once given access to a bit of capital.

MICROFINANCE AS A CREDIT CARD?

What then is the role for microfinance? Why do poor people stick with it? Why does it continue to grow by the year? To answer these questions, it's helpful to start with an anomaly: In practice, microfinance activity more closely resembles the provision of consumption loans than business loans, revealing a different picture of the financial needs — and financial lives — of poor households. The rhetoric around microfinance obscures the reality that borrowers are consumers, too, and what many often seek is simply better ways to spend, not just to invest in business.

Like typical consumer loans — and like credit cards — microfinance loans allow borrowers to make big purchases and repay over time (with interest). Grameen-style microfinance loans require that loans are repaid steadily through weekly installments, a structure that looks more like a typical consumer loan than a business loan. (In contrast, a typical business loan would allow borrowers to invest the funds and only much later, once profit has been generated, repay the loan with the accumulated revenues.)

Recent village studies, especially those using the close observations of financial diaries methods, show that loans are desired and used for many purposes beyond business. Incomes are seldom steady and predictable; needs vary as well: families need to pay for schools, medicines, and food during slow periods. They might need to buy bus tickets to get to the city for a job, upgrade their homes, or simply pay down a more expensive loan. Borrowers repay the loans in small bits using whatever household income is available. Stuart Rutherford's financial diaries from Bangladesh, included in the book *Portfolios of the Poor*, reveal many such examples (Collins et al. 2009). Rutherford spent time with a small group of Grameen Bank customers and found that only half of "business" loans were used for business purposes (and under half when weighted by the size of loans). I found the same in a national survey in Indonesia (Johnston and Morduch 2008), and others reveal similar patterns in India, Peru, and elsewhere.

Evidence that microfinance loans are used to fund non-business needs (even if for education or health) is sometimes used to criticize microfinance, but that misses the point. As Collins et al. (2009) argue, microfinance in practice can add critical sources of finance that can be added to other funds used to manage day-to-day cash flows, accumulate large sums for lumpy expenses (including investment), and cope with risk. In a wide variety of situations, microfinance loans can be relied on to help liquidity-constrained households put together the money they need at the moment they need it. The result may be to improve the families' situations, even if their businesses don't grow and incomes do not rise (even if they don't actually have a business!). The notion that business finance is the single, main need for finance for poor households does not square with the evidence. Rather, poor families, like richer families, need broad

financial tools. In fact, the poor may need them more urgently.

If we drop the illusion that microfinance loans are necessarily business loans (and the assumption is dropped that everyone is a budding entrepreneur), it is easier to see how microfinance works. It becomes easier to see how microfinance addresses the challenges posed by the illiquidity of borrowers. And it becomes easier to anticipate (and more directly address) problems such as over-indebtedness and the lack of adequate consumer protections in the sector (see Guérin et al. 2015 and Karim 2011). It also is easier to see that microfinance is a complement to — not a substitute for — social insurance and other interventions that bring public resources into poor communities.

Ultimately, Yunus's talking points were, if anything, too easily appealing in their moment. Microfinance is instead best thought of as a device like a credit card: it can be very helpful, sometimes harmful, and seldom truly transformative. Microfinance loans differ from credit cards in important ways too; they are fixed loans, not lines of credit, and they have clear rules and structures that make it more difficult — but not impossible — to get into real trouble with debt. Only with a sharper understanding of how microfinance is actually used can providers develop better options and safeguards. This vision of microfinance may not sell as well to donors, but it may describe the device that families most need and value. ■

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BIBLIOGRAPHY

Armendàriz, Beatriz and Jonathan Morduch. 2010. *The Economics of Microfinance*, Second edition. Cambridge, MA: MIT Press.

Bateman, Milford and Ha-Joon Chang. 2012. "Microfinance and the Illusion of Development: From Hubris to Nemesis in Thirty Years." *World Economic Review* 1: 13-36.

Collins, Daryl, Jonathan Morduch, Stuart Rutherford, and Orlanda Ruthven. 2009. *Portfolios of the Poor: How the World's Poor Live on $2 a Day.* Princeton, NJ: Princeton University Press.

Cull, Robert, Asli Demirgüç-Kunt, and Jonathan Morduch. 2018. "The Microfinance Business Model: Enduring Subsidy and Modest Profit." *World Bank Economic Review*, forthcoming. https://doi.org/10.1093/wber/lhx030

Ferguson, James. 2015. *Give a Man a Fish: Reflections on the New Politics of Redistribution.* Durham, NC: Duke University Press.

Guérin, Isabelle, Labie, Marc and Servet, Jean-Michel. 2015. *The Crises of Microcredit.* London: Zed Books.

Johnston, Don Jr. and Jonathan Morduch. 2008. "The Unbanked: Evidence from Indonesia." *World Bank Economic Review* 22 (3): 517-537.

Karim, Lamia. 2011. *Microfinance and Its Discontents: Women in Debt in Bangladesh.*Minneapolis, MN: University of Minnesota Press.

Mossman. Matt. 2015. "Moving Beyond Microcredit." *The New Yorker*. November 2, 2015.

U.S. House of Representatives. 1986. "Microenterprise Credit." Hearing of the Select Committee on Hunger and Subcommittee on International Development Institutions and Finance, Committee on Banking, Finance, and Urban Affairs. February 25, 1986. https://catalog.hathitrust.org/Record/007414506

Humility and Hubris in Hydropower

Austin Lord considers the unstable politics of micro-hydropower development in the wake of Nepal's 2015 earthquake.

MICRO-HYDROPOWER TECHNOLOGIES—systems that harness the energy in flowing water to produce between 5 and 100 kilowatts of electricity—have proven to be a particularly attractive kind of "little development device" in Nepal. While Nepal is a country with abundant water resources, the same fractal topography that provides Himalayan "hydraulic head" also limits the reach and feasibility of large-scale energy infrastructures. In recent decades, as plans for large-scale hydropower projects requiring big dams have waxed and waned, micro-hydropower projects that function at the community scale have provided electricity to hundreds of thousands of people living beyond the national grid.

More than 3,000 micro-hydropower projects capable of generating an estimated 48 megawatts have been built to date, constituting roughly 5 percent of Nepal's total electricity generation (AEPC 2016). Considered against a backdrop of protracted political volatility and recursive patterns of developmental promise and failure, the proliferation of micro-hydropower in Nepal emerges as a tentative success story. A recent report by the UN Conference on Trade and Development (2017), for example, suggests that 81.7 percent of Nepal's rural population now has reliable access to electricity.

On April 25, 2015, the 7.8-magnitude earthquake that struck Nepal prompted new questions about the relationship between energy security, environmental risk, and community resilience. Amid the diverse futures and risks carried by different forms of hydropower development in Nepal, micro-hydro technologies

FIGURE 1. Small, medium, and large scale hydropower projects licensed for development in Nepal at the time of the April 2015 earthquake—micro- and mini-hydropower projects smaller than 1 megawatt are not pictured. An interactive version of this map is available at http://nitifoundation.org/hydro-map
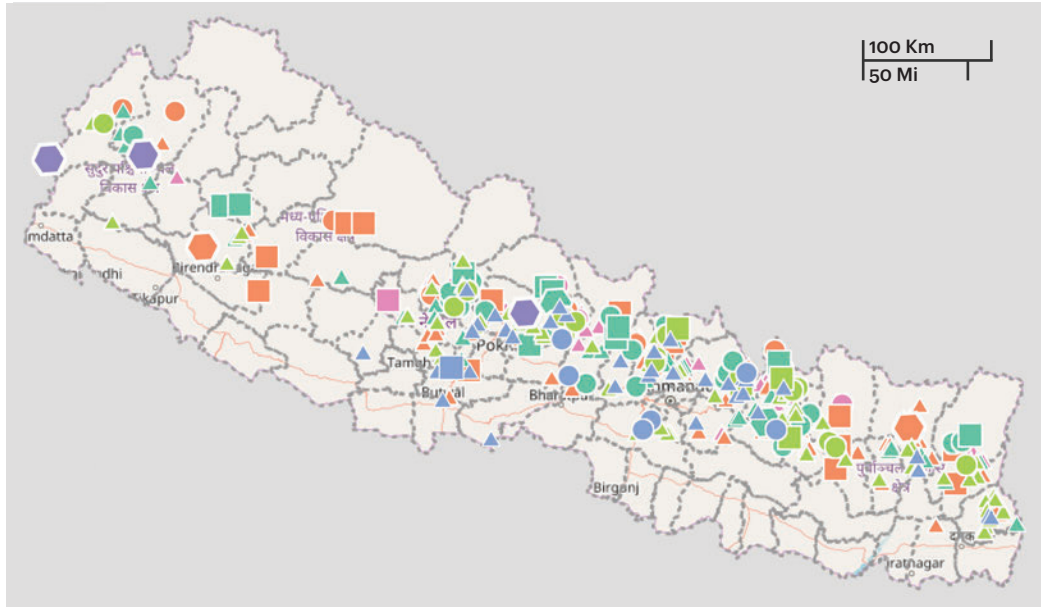
have helped facilitate the work of post-disaster recuperation and repair. In the Langtang Valley, the contrast between local efforts to construct a community-scale micro-hydropower project and plans for the much larger, 400-megawatt, Langtang Storage Project are examples of this.

LITTLE TURBINES AND BIG DAMS

For the Langtang community, which was devastated by a massive co-seismic avalanche during the earthquake, the micro-hydropower project has emerged as a technology of hopeful post-disaster recovery and an investment in local autonomy. For planners, policymakers, and developers in Kathmandu, the separate large-scale storage project (designed to create a strategically important high-altitude reservoir that could help generate dry-season power and potentially supply drinking water to Kathmandu) is an important step in their ongoing project of "making a hydropower nation" (Lord 2014; Lord 2016). The contrast between these two differently imagined energy futures speaks to the scalar politics of energy security and the ways that Nepal's hydropower frontier (half real, half imagined) is shaped by diverse economies of anticipation (Cross 2015).

In Nepal, micro-hydropower typically is framed as a technology for the liminal mean-time: a temporary fix that eventually will become redundant with the arrival of an infrastructural future perfect. Nepalis living in communities away from the grid commonly reference micro-hydropower as a technology

for coping with disconnection, abjection, uncertainty, and absence. As Cross (2016) also has pointed out, "Off the grid, grids do not disappear into the background but become the object of heightened attention. In places that are not connected to the electricity grid, and have little prospect of future connection, large scale electricity infrastructures can become more rather than less prominent" (194).

As one woman in the Lamjung district told me in 2014, for example: "Only after I am dead will electricity from the [Nepal Electricity] Authority come (*Ma marepacchi matrai pradikhaaranko bijuli aauncha).*" For Nepalis who identify themselves as members of a neglected infrastructural public (cf. Collier et al. 2016), micro-hydropower technologies offer a means of securing not only energy but also dignity, agency, and relative autonomy.

Yet in the wake of a disaster like the 2015 earthquake, the question of "what kind of hydropower development and for whom" re-emerges. In places like Nepal's Langtang Valley, ongoing debates about "the damage done and the dams to come" in seismically active hydroscapes are particularly pertinent (Rest et al. 2015; cf. Butler and Rest 2017; Lord, in press). Though all infrastructures are contingent—tentatively situated in "demanding environments" (Carse 2014) and inclusive of their own potential ruination (Howe et al. 2016)—it is increasingly obvious that, in the Himalaya and elsewhere, some infrastructures are more precarious than others.

ANTICIPATION AND SEISMIC RISK

When the earthquake struck Nepal, I was standing in a part of the Langtang Valley that would be flooded by the lower dam of the proposed Langtang Storage Project—a 400-megawatt, two-stage reservoir project that is imaginatively rendered in a map of "Rasuwa Tomorrow" (see fig. 2). Just a moment prior, I had been discussing the prospect of this project with a Langtangpa hotelier named Dindu.

Like many other potentially "project-affected people" living across Nepal's hydropower frontier, Dindu viewed the coming of a large hydropower project as a kind of opportunity—an infrastructural undertaking that would bring roads, a greater flow of tourists, and increased political connectivity. As a well-educated man, he also knew that the project would include a budget for "corporate social responsibility" that could be used to fund community development projects in the affected area. He also was aware of recent industry trends focused on "sharing the benefits" of hydropower development that already had turned several hundred thousand Nepalis into "local investors"—by selling them an equity stake in hydropower companies on the Nepal Stock Exchange (Lord 2016; Lord, in press). As one of more than 30,000 satisfied local shareholders of the Chilime Hydropower Company, which had constructed a 22-megawatt project downstream more than a decade earlier, he was interested in future opportunities for investment.

Standing outside his kitchen, Dindu and I spoke of the potential social and environmental impacts of the project, but not of seismic risk.

Suddenly, the earth heaved beneath us and a series of landslides broke loose from the steep valley walls above. Dindu grabbed my hand and we ran for open ground, struggling to keep our feet as the earth shook for a whole minute. We felt a wave of cold air, and it started to rain heavily as debris poured down around us. Confusion reigned. When the air cleared, we could see that a massive mixed-debris avalanche had buried the ancestral village of Langtang (see fig. 3), just a few kilometers upslope from us, taking the lives of more than 300 people. The scale of devastation and loss was incomprehensible.

The earthquake caused significant loss of life, widespread destruction of property, and debilitating damage to a variety of critical infrastructures across Nepal. According to the official Post-Disaster Needs Assessment conducted in June 2015, seventeen grid-connected hydropower projects representing roughly 15 percent of national generation capacity were "severely damaged," and damage to transmission and

distribution infrastructures left some 600,000 households without electricity (Government of Nepal 2015). The event also troubled the making of Nepal's promised energy future, as dozens of hydropower projects still under construction were damaged—in some of these areas, locals say that landslide occurrence was intensified by the blasting of project tunnels. In short, the event exposed a variety of threats to large-scale infrastructures.

Walking through the avalanche zone a few months after the earthquake, I encountered the remains of the Langtang community micro-hydropower project. Built in 1998 with support from a Japanese NGO, the project was presented as both an investment in community infrastructure and a technology of environmental governance—one of several initiatives designed to help the Langtangpas sustainably accommodate rising tourism in Langtang National Park, which was created around the community in 1976. As tourism and local demand for electricity

FIGURE 2. "Rasuwa Tomorrow," an image created in 2014 by the Chilime Hydropower Company depicting an imagined infrastructural future in the northern region of Nepal's Rasuwa District. In the upper-right quadrant of the frame, between images of gondolas and skiers, one can see the double reservoirs of the proposed Langtang Storage Project above and below Langtang village.

FIGURE 3. Langtang village, before and after the avalanche. PHOTO: DAVID BREASHEARS/GLACIERWORKS

FIGURE 4.
A photograph of the lights of Langtang village, taken shortly after the installation of the first micro-hydropower project in 1998.
PHOTO: K. TOGAMI, THE TOKYO SHIMBUN

atomic bomb (Kargel et al. 2016)—could have caused a dam failure, and perhaps thousands more deaths downstream. How to think the unthinkable?

MICRO-HYDROPOWER AND RECONSTRUCTION

In the aftermath of the disaster, the entire Langtang community was displaced to Kathmandu, where they lived in a camp for internally displaced persons for several months. As the aftermath dragged on, the people of Langtang slowly returned to begin the long and painful process of rebuilding their lives—despite the extreme level of damage, a remarkable lack of support from the Government of Nepal, and the logistical challenges of rebuilding in such a remote location.

continued to increase, the project was upgraded to 11 kilowatts—indexing both an improvement in the material conditions of life in the valley and changes in the ways the Langtangpa were "imagining the good life" (Lim 2008). When the avalanche came, it took the micro-hydropower project, and everything else. But, critically, the destruction of this project did not amplify the effects of the disaster or expand vulnerability/exposure.

Since the vast majority of the dams planned across Nepal had not yet been constructed when the earthquake hit, there were no dam failures. However, if the proposed Langtang Storage Project had been built prior to the earthquake, then the avalanche—a mass of 3 billion kilograms that fell more than 3,000 meters from the slopes of Langtang Lirung (7,234m), covering a kilometer of the Langtang river in debris while releasing half the force of the Hiroshima

Though the earthquake had damaged more than 300 micro-hydropower projects, the majority could be retrofitted or repaired (Government of Nepal 2015). While the Langtang community had repaired the micro-hydropower facility and local transmission systems several times in the past (in response to damage inflicted by storms, rockfall, and smaller avalanches) the exceptional intensity of the 2015 avalanche and questions of safety at the project site prevented them from doing so again. They had to formulate a new energy strategy.

For more than two years, the Langtangpa relied on solar units for electricity (mostly donated by humanitarian organizations and volunteers after the disaster, with a few older units salvaged from the hotels). When the Langtang Management & Reconstruction Committee announced plans to construct a *new* micro-hydropower project in late 2016, it seemed like a hopeful point of inflection in the process of

FIGURE 5.
The remains of the Langtang micro-hydropower project.
PHOTO: AUSTIN LORD

FIGURE 6. Project materials being airlifted by helicopter to the project site at Kyangjin Gompa in November 2016.
PHOTO: NIMA LAMA

reconstruction and recovery.

Construction on the project, relocated to a new site further up the valley near Kyangjin Gompa, began in early 2017. The project was funded largely by a British NGO called Kadoorie (an organization focused on agricultural development and community infrastructure, now working to support post-disaster recovery) with additional contributions from the Langtang Management & Reconstruction Committee and the Local Development Office of Rasuwa District. With the permission of the Langtang National Park, the capacity of the new project was scaled up to 100 kilowatts, to provide electricity to 116 households, a variety of communal buildings, and the recently rebuilt monastery at Kyanjin Gompa. The project is also expected to support a handful of local enterprises, such as the famous yak-cheese factory that processes milk from local herders, which will now use far less fuelwood for pasteurization.

The local leaders of the Micro-Hydropower Project Committee that was created to manage the construction process often describe the project as an effort to create a secure future. For them and many other Lantangpas, it is important that the project provides *more* than enough power to meet current needs, that it will be able to accommodate *future* demand once the Langtang Valley makes a full recovery. In this sense, the micro-hydropower project has been maximized, so as to obviate the need for future upgrades or external support—to sustain Langtang society beyond the reconstruction phase as the shape of its needs continue to change.

When I visited the Langtang Valley in July 2017, the majority of people were still rebuilding their houses and the path was lined with transmission poles awaiting power lines (see fig. 7). The project site was a tangle of activity, with one team installing the turbine assembly inside the powerhouse and another busy constructing the 230-meter penstock pipe that would be used to channel water from the lake. Electricity meters and spools of wire were stacked up inside the powerhouse. After several weeks spent transporting materials to the site, all was ready.

Later that day, I met with Son Nurpu, the Secretary of the MHP Project Committee, and climbed up to the project intake at Lirung Tal (the glacial lake that supplies the new project, located roughly 150m higher than the powerhouse). Along the way, he explained more about the technicalities of construction process, the trainings that the local technicians had received, the local electricity metering system they would manage, and the work that still remained. When we reached the lake, Son Nurpu climbed onto the headworks at the outlet of the lake and posed theatrically, smiling with a contagious enthusiasm. After watching the broader Langtang community struggle for more than two years, this was a powerfully affective and hopeful moment.

RECUPERATION AND REPAIR

As an off-grid infrastructure, the micro-hydropower project in Langtang functions in two registers: it facilitates systemic recovery while also creating space for and enabling the more creative and hopeful practices of recuperation. As Guyer (2017) suggests, efforts toward recovery focus on functionality and reconstitution, while practices of recuperation are more improvisational, fragmentary, and open-ended.

If micro-hydropower projects like this are successful, perhaps it is because they are adaptable and can be reconfigured to serve diverse communities and needs. In this sense, micro-hydropower is a "fluid technology" (Law and Mol 2001; Redfield 2016), which can

be reconfigured to fit the exigencies of a particular landscape and create "fluid space" outside of broader networks, like the grid. Indeed, micro-hydropower has been used for centuries in a variety of cultures and conditions, in the cracks and gaps of other systems, well before it acquired its current status as a "little development device." The resilient and fluid qualities of micro-hydro that humanitarians now acknowledge are intrinsic to its historical success.

Though the Langtang micro-hydropower project has only just been built, the site-specific and improvisational quality of the design speaks to its fluidity.

The unique location of this project, which is

sited at the outlet of a glacial lake at an elevation of 4055m (reportedly the highest project site in Nepal), speaks to the ways that micro-hydropower systems can be adapted to the particularities of landscapes. For centuries, the people of Langtang have been living with and adapting to geological hazards and climatological exposures: repairing homes, trails, and other local infrastructures as needed in response to landslides, avalanches, earthquakes, and storms. They have developed their own version of what Jackson (2014) conceptualizes as "broken world thinking," oriented around the repeated practice of "the subtle arts of repair by which rich and robust lives are sustained against the

weight of centrifugal odds" (222). As such, the new project was built in an area the locals say is naturally sheltered from future avalanches by a nearby glacial moraine—it was *reconfigured* and *placed* in the landscape.

In response to a suggestion from Sangay, one of the Langtangpa *lamas* (Tibetan Buddhist monks), the design of the micro-hydropower project also was modified so that the water flowing through the turbines could be diverted to turn a large prayer wheel housed within a recently built Memorial Stupa—a structure dedicated to the memory of those who lost their lives during the earthquake, constructed in part by donations from families around the world who lost loved ones in Langtang. This joining of infrastructure with local practices of prayer and memorialization is particularly important because Langtang is considered a *beyul*, or a sacred hidden valley meant to serve as a refuge for Tibetan Buddhist practice (Lim 2008). This particular improvisation scales up the traditional practice of building smaller prayer wheels that can be turned by a mountain stream—a design that predates the advent of electricity and is still used throughout the Himalaya. As the water flows through the prayer wheel it is understood to be sending prayers to the heavens in perpetuity, animating the scarred landscape.

In these ways, the micro-hydropower project has become meaningfully imbricated in localized processes of recuperation and repair in a way that would not have been possible with a larger and pre-configured technology. It was designed to account for both the material agencies of the environment and its own precarity, and reconfigured in ways that enabled the contingencies of local "repair work." As Jackson (2014) explained, the work of "repair occupies and constitutes an aftermath, growing at the margins, breakpoints, and interstices … it fills in the moment of hope and fear in which bridges from old worlds to new worlds are built, and the continuity of order, value, and meaning gets woven, one tenuous thread at a time" (223). The construction of this new micro-hydropower project in Langtang, a highly situated and highly relational infrastructural technology, reflects the multivalent efforts required to weave a fractured community back together in the wake of disaster.

INSTABILITY AND THE 'HYDROPOWER NATION'

When the earth shook, it created a series of cracks in the future perfect, momentarily interrupting Nepal's dream of becoming a "hydropower nation" and creating an opportunity to rethink the country's energy strategy. In the aftermath of the 2015 earthquake, one of Nepal's most prominent politicians and policymakers co-authored a piece in The New York Times calling for a more diversified energy strategy in Nepal. In no uncertain terms, the piece asked, "Can Nepal rely on its built and planned hydro infrastructure given the inevitable seismic activity in the Himalayas?" (Thapa and Shrestha 2015: 1).

Ongoing debates over the inherent risks of hydropower development in the Himalayan region point to a need for "technologies of humility" (Jasanoff 2003) that recognize the limits of knowledge and prediction. As a place where the material agency of the landscape has been made so apparent and so much is uncertain or unknown, the Langtang Valley seems

FIGURE 13 (LEFT).
The Langtang Memorial Stupa, where water diverted for the micro-hydropower project is now flowing beneath this stupa, turning a large prayer wheel inside.
PHOTO: AUSTIN LORD

FIGURE 14 (RIGHT).
A photo of the micro-hydropower project demonstrating its scale and position in the broader landscape, taken shortly before project completion.
PHOTO: AYAKO SADAKANE

an appropriate place to consider the value of humility. Indeed, with an earthquake even more powerful than that which devastated the Langtang Valley in 2015 now considered overdue in Western Nepal, and massive uncertainties about the impacts of climate change lingering over the Himalaya like a cloud, a degree of infrastructural humility would seem critical.

Yet in contrast to the humility of micro-hydropower, the large hydropower projects being planned and built across the Himalaya, which require building immense webs of concrete and tunnels throughout a seismically active zone, seem to materialize a specific kind of infrastructural hubris.

In the wake of the earthquake, the Government of Nepal has expended considerable energy to ensure that its hydropower frontier has remained open for business. Official plans for large-scale hydropower infrastructures remain intact, emboldened by the speculative logics of finance capital, geopolitically inflected narrative of energy sovereignty, and the inertia of infrastructural affect focused on a dream deferred (Lord, in press). This failure to reckon the inherent precarity of Nepal's imagined hydropower future reflects a familiar pattern of infrastructural ambition and oversight (Huber et al. 2017; Butler and Rest 2017). Like large-scale infrastructure projects across the globe, Nepal's big hydropower projects are imaginative undertakings enacted "through engineering hubris, false environmental assumptions, and short-sighted development policies" that elide their own vulnerabilities (Carse 2017: 905). The continued focus on achieving energy security at the national scale marginalizes alternative accounts of Nepal's energy futures and perpetuates a "strategic ignorance" (McGoey 2012) of palpable environmental and infrastructural risks.

BETWEEN HUBRIS AND HUMILITY

At the time of this writing, the Langtang micro-hydropower project has just been completed, and the lights are on throughout the valley—which this struggling community is incredibly proud of. Tellingly, at the same time, the 400-megawatt Langtang Storage Project is moving ahead as planned—with the support of state officials, the Langtang National Park, the private sector, and a segment of the Langtang community. Helicopters are flying into Langtang with surveyors; contracts are being discussed. As post-disaster reconstruction continues, new uncertainties are emerging.

Across the Himalayan region and perhaps the world, infrastructures and their infrastructural publics are constantly being made and unmade, prompting a tacking back and forth between hubris and humility. When speaking about the large-scale project and the increased connectivity it might bring, many Langtangpa express a kind of ambivalence, often using a classic Nepali phrasing to highlight the double-edged nature of development, pointing to "*bikas sangai binas* [development with destruction]". Some fear the changes the large-scale project could bring; others still dream of "Rasuwa Tomorrow." When considering the entanglement of these differently imagined futures and the technologies used to enact them, the question recurs: what kind of development or destruction, and for whom? ∎

BIBLIOGRAPHY

Alternative Energy Promotion Centre, Ministry of Population and Environment, Government of Nepal. 2017. Website & Data. http://www.aepc.gov.np/

Butler, Christopher, and Matthäus Rest. 2017. Calculating Risk, Denying Uncertainty: Seismicity and Hydropower Development in Nepal. *HIMALAYA, the Journal of the Association for Nepal and Himalayan Studies,* 37(2): 15–25.

Carse, Ashley. 2014. *Beyond the Big Ditch: Politics, Ecology, and Infrastructure at the Panama Canal.* Cambridge: MIT Press.

Carse, Ashley. 2017. "An Infrastructural Event: Making Sense of Panama's Drought." *Water Alternatives,* 10(3): 888–909.

Collier, Stephen; Chris Mizes; and Antina von Schnitzler. 2016. "Preface: Public Infrastructures / Infrastructural Publics." *Limn,* 7(1). http://limn.it/preface-public-infrastructures-infrastructural-publics/

Cross, Jamie. 2015. "The Economy of Anticipation: Hope, Infrastructure, and Economic Zones in South India." *Comparative Studies of South Asia, Africa and the Middle East,* 35(3): 424-437.

Cross, Jamie. 2016. "Off the Grid: Infrastructure and Energy Beyond the Mains." In *Infrastructures and Social Complexity: A Companion.* Harvey, Jensen, and Morita eds. Abingdon, UK: Taylor & Francis, 186-196.

Government of Nepal, National Planning Commission. 2015. "Post Disaster Needs Assessment, Vol. B: Sector Reports." Kathmandu: Government of Nepal. http://www.npc.gov.np/images/category/PDNA_volume_BFinalVersion.pdf

Guyer, Jane. 2017. "Aftermaths and Recuperations in Anthropology." *Hau: Journal of Ethnographic Theory,* 7(1): 81–103.

Howe, Cymene et al. 2016. "Paradoxical Infrastructures: Ruins, Retrofit, and Risk." *Science, Technology, & Human Values,* 41(3): 547–565.

Huber, Amelie, Santiago Gorostiza, Panagiota Kotsila, María J. Beltrán, and Marco Armiero. 2017. "Beyond 'Socially Constructed' Disasters: Re-politicizing the Debate on Large Dams through a Political Ecology of Risk." *Capitalism Nature Socialism,* 28(3): 48–68.

Kargel, J.S. et al. 2016. "Geomorphic and Geologic Controls of Geohazards Induced by Nepal's 2015 Gorkha Earthquake." *Science,* 351(6269).

Jackson, Steven. 2014. "Rethinking Repair." In *Media Technologies: Essays on Communication, Materiality, and Society,* Gillespie, Boczkowski, and Foot eds. Cambridge, MA: MIT Press, 221–239.

Jasanoff, Sheila. 2003. "Technologies of Humility: Citizen Participation in Governing Science." *Minerva,* 41(3): 223–244.

Law, John, and Annemarie Mol. 2001. "Situating Technoscience: An Inquiry into Spatialities." *Environment and Planning D: Society and Space,* 19(5): 609–621.

Lim, Francis Khek Gee. 2008. *Imagining the Good life: Negotiating Culture and Development in Nepal Himalaya.* Leiden: Brill.

Lord, Austin. 2014. "Making a 'Hydropower Nation': Subjectivity, Mobility, and Work in the Nepalese Hydroscape." *HIMALAYA, the Journal of the Association for Nepal and Himalayan Studies,* 34(2): 111–121.

Lord, Austin. 2015. Langtang. Hot Spots, *Cultural Anthropology* website, October 14, 2015. https://culanth.org/fieldsights/731-langtang

Lord, Austin. 2016. "Citizens of a Hydropower Nation: Territory and Agency at the Frontiers of Hydropower Development in Nepal." *Economic Anthropology,* 3(1): 145–160.

Lord, Austin. In Press (2018). "Speculation and Seismicity: Reconfiguring the Hydropower Future in Post-Earthquake Nepal." In *Water, Technology, and the Nation-State.* Filippo Menga and Erik Swyngedouw eds. London: Routledge Earthscan.

McGoey, Linsey. 2012. "Strategic Unknowns: Towards a Sociology of Ignorance." *Economy and Society*, 41(1): 1–16.

Redfield, Peter. 2016. "Fluid Technologies: The Bush Pump, the LifeStraw® and Microworlds of Humanitarian Design." *Social Studies of Science,* 46(2): 159–183.

Rest, Matthäus, Austin Lord, and Christopher Butler. 2015. "The Damage Done and the Dams to Come." Hot Spots, *Cultural Anthropology* website. 14 October 2015. https://culanth.org/fieldsights/730-the-damage-done-and-the-dams-to-come

Thapa, Gagan, and Kashish Das Shrestha. 2015. "Natural Disasters and Nepal's Energy Security." *The New York Times*, DotEarth Blog, May 25, 2015. https://dotearth.blogs.nytimes.com/2015/05/25/one-two-punch-of-earthquakes-and-landslides-exposes-hydropower-vulnerability-in-nepal/

United Nations Conference on Trade and Development (UNCTAD). 2017. "The Least Developed Countries Report 2017: Transformational Energy Access." Geneva, Switzerland: United Nations. http://unctad.org/en/PublicationsLibrary/ldcr2017_en.pdf

A SLIGHTLY BETTER SHELTER?

IKEA SHELTER IMAGES. PHOTO: MARK E. BREEZE

Tom Scott–Smith gets inside an award–winning shelter designed for refugees and asks: what makes it any better than a tent?

THE SHELTER

On January 26, 2017, the IKEA refugee shelter was declared the worldwide Design of the Year in a unanimous decision.[1] When I interviewed one of the jurors about the process I was told that they'd chosen the "obvious winner": the IKEA shelter was high profile, it had featured widely in the media, it was a positive story with a clear social purpose, and it offered a practical solution to the so-called "refugee crisis," one of the most significant issues of the previous twelve months.[2] The London Design Museum has

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1   The phrase "IKEA refugee shelter" is a misnomer. As explained below, this object has been produced by a group of Swedish industrial designers who received financial support and sponsorship from the IKEA Foundation. The formal name for the product is the Better Shelter, but the phrase "IKEA refugee shelter" is still widely used. I continue to use it partly for the sake of recognition, and partly to highlight the intimate connection with IKEA, which is central to the story of this product despite being made distant through several degrees of institutional separation.

2   I use scare quotes around the idea of "crisis" here for three reasons: first, because the "refugee crisis" is based on a doubtful claim that the number of refugees in the world today is "unprecedented". Second, because much larger refugee numbers routinely arrive in developing countries – this situation is only a "crisis" because it has affected the rich world. And third, the crisis has not been a result of refugee numbers, which is relatively manageable, but the political response. If anything, this is not a refugee crisis, but a hospitality crisis.

been awarding the "Design of the Year" for a decade now, celebrating examples that "promote or deliver change, enable access, extend design practice, or capture the spirit of the year" (Beazley 2017). The IKEA refugee shelter seemed to match all of these aims, claiming to be modular, sustainable, long lasting, recyclable, easily assembled, affordable, and scalable. It was installed on the Greek islands to shelter newly arrived refugees in 2015, and it came with the backing of the United Nations (UN) Refugee Agency, who purchased 15,000 units for distribution around the world.

The juror I spoke to explained that the shelter won because it "tackles one of the defining issues of the moment: providing shelter in an exceptional situation whether caused by violence [or] disaster.... [It] provides not only a design but secure manufacture as well as distribution." A statement described the project as "relevant and even optimistic," concluding, "it shows the power of design to respond to the conditions we are in and transform them" (Beazley 2017; personal interview, April 25, 2017, Design Museum, London).

It is easy to understand why this shelter has generated so much interest since it was first announced in 2013. It has received funding from IKEA, a company that has shaped so much of everyday life in the Global North and whose minimalist modernism has populated so many domestic environments. As Keith Murphy points out, there is a social democratic spirit underpinning so much of Swedish design, a combination of simplicity, affordability, and universality that both reflects and promotes a more egalitarian social order (Murphy 2015; see also Garvey 2017). When applied to refugee housing, this has all the makings of positive story. The media are given something their readers can relate to—the experience of unpacking and constructing IKEA flat-pack furniture—and can connect it to a problem that concerns us all: how to house the millions of refugees we see on the news. The IKEA refugee shelter, the story goes, can be assembled in four to six hours with a basic manual and no specialist tools. Everything comes in two compact boxes, much like those that contain your new bed and table from the IKEA store. More attractively, the design arrives with a number of innovative little tricks, including a photovoltaic panel that provides sufficient electricity to power a small light and mobile phone charger. It seems like a heartwarming example of philanthro-capitalism, good design, and humanitarian innovation (Scott-Smith 2016). What's not to like?

For anyone who has actually seen the shelter up close, it looks rather mundane after this hyperbolic description. It has a

rectangular floor plan, vertical walls, and a pitched roof. The shelter is fairly small, covering an area of 17.5 square meters, and it is designed to house a family of up to five people. When inside, you can look up and see the entire structure laid bare: a standalone steel frame with imposing horizontal beams, onto which foam panels are clipped. These panels are made from polyolefin, a light, flexible plastic, and they have the feeling and texture of swimming floats. They have been attached to the frame with hand-tightened bolts and brackets, and the shelter has four small 'window' openings, ventilation slots, and a lockable door. The main designer described its chunky, basic appearance as the kind of house "a 5-year-old would draw" (personal interview, May 18, 2017, Stockholm). It is, indeed, visually uninspiring, but this is because it is *meant* to be basic. Like much of IKEA's product line, it is mass-produced, economical modernism. It is meant to offer a shelter that is immediate, quick, affordable, and easily transportable, staying as close as possible to the price and weight of the main alternative: the tent.

Tents have been the go-to shelter for humanitarian organizations for more than 50 years. The UN Refugee Agency distributes tens of thousands of them annually, and they are still valued for their lightweight, inexpensive simplicity. To be taken seriously as a humanitarian product, therefore, the IKEA shelter needs to be comparable to the tent in terms of price and weight while making some crucial improvements. There are four, in particular, that can be found in this design. First, the IKEA shelter provides increased security through a lockable door. Second, it provides greater privacy through firmer and more opaque walls. Third, it provides improved communication with a mobile phone-charging station. And fourth, it lasts considerably longer: up to four years rather than just one. These improvements encapsulate the basic requirements for dignified living according to the designers, combining security, privacy, durability, and connection to the outside world. These features, the narrative goes, are particularly important given the protracted nature of so many contemporary refugee situations and the likelihood of a lengthy exile.[3]

When I spoke to the designers about dignity, they came back again and again to the same material expressions, which were fascinating in their tangibility and their conception of refugee social worlds. Dignity meant being able to stand up in the IKEA shelter, which is impossible in a tent. Dignity meant having walls that were "knocky": firmer, more secure, more resonant when tapped, which distinguished the materials from tarpaulin. Dignity meant privacy: whereas silhouettes can cause a problem in tents, the IKEA shelter does not reveal activity inside when the lights are on at night; its material is more opaque and disperses the shadows. Such improvements, however small, allow the design team to mobilize a more expansive, idealistic rhetoric. In its publicity materials, the shelter has become a "safer, more dignified home away from home for millions of displaced people across the world." It has channeled "smart design, innovation and modern technology" to offer "a sense of peace, identity and dignity." It is "universally welcoming", a "home away from home" that balances "the needs of millions of people living in different cultures, climates and regions with a rational production—a single solution" (Better Shelter 2015; personal interview, May 19, 2017, Stockholm, Sweden). Far from being a better tent, this shelter has some revolutionary ambitions. But *is* it a better tent? Does it live up to its aims of producing a compact, cheap, lightweight product for meeting a basic human need?

THE REACTION
The day after the announcement of the prize I sensed a collective sigh of despair among my colleagues working on refugee issues, which was tangible in personal conversations, snarky asides, and exasperated emails. The failures of the shelter were, for many of them, far too obvious. It was meager, limited, with no proper floor, no insulation, no natural light, and with a structure that let in drafts and dust. It had been oversold, under-ordered, and was described as sustainable when in fact it involved flying piles of metal and plastic around the world. It ignored established practice in the humanitarian shelter sector, which advocates the

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3   The whole design of this shelter emerged in part from UN High Commissioner for Refugees's (UNHCR's) recognition that refugees are spending ever-longer periods in camps, and therefore tents are no longer suitable due to their short lifespan.

use of local materials and abundant local labor, and, above all, it was accompanied by an insistent triumphalism, with media reports pushing the narrative that an intractable problem had been solved. It had not. Managing refugee arrivals is a complex political issue that requires sustained political engagement, legal reform, and advocacy in host states to ensure investment in welfare and protection. Although these were not the aims of the IKEA refugee shelter, such lavish praise and attention, my informants felt, were a distraction. Many such "innovative designs" have become a fetish, creating a mistaken reassurance that circumstances can be controlled while obscuring a series of more serious, structural issues that remain unaddressed (Scott-Smith 2013). The most tangible criticisms of the IKEA shelter, I soon realized, came from two opposing directions. On the one hand, there were those who argued the shelter did too little. It was a mean little space, they suggested, that looked like a garden shed or, due to its plastic panels, a chemical toilet. This line of critique usually came from architects, who filed the object contemptuously under "product design" and declared that it involved no architectural thinking at all. Architecture, they pointed out, should respond to the site and local environment, not mass-produce a universal design with no adaptability or control. Architecture should create sensitive and carefully planned responses to specific problems, not ignore basic elements such as insulation, proper flooring, and natural light. Architecture should also be pleasing to the eye. If you took the Vitruvian triad of architectural virtues, the IKEA shelter seemed to fail on every count. *Firmitas, utilitas,* and *venustas* was the aim, but the shelter was flimsy rather than firm, flawed rather than useful, ugly rather than beautiful.[4] It was particularly galling for this group of critics that the shelter won not just Design of the Year, but that it won the *architectural* category as well.

The other type of criticism came from humanitarians. They argued not that the shelter did too little, but that it did too much. It provided a fully integrated, flat-pack solution when this was rarely required or appropriate. It flew in a prefabricated house when there were better opportunities to work from the bottom up. It lionized designers when design was rarely a priority. Unlike architects, humanitarians were working in a context of limited time and limited resources. They worked with the mantra that "shelter is a process not a product," a slogan that derives from the work of Ian Davis (1978), one of the founding thinkers of the humanitarian shelter sector, who

argued that humanitarians needed to focus on the way people shelter themselves. Davis said that disaster-affected communities had their own techniques for finding and building shelter, suggesting that humanitarian shelter should mean *dis*couraging designers and other outside "experts." The priority should be to provide materials such as wood, nails, tarpaulin, and tape that help people build their own homes. These could be used and reused as people expanded their accommodation. The crucial task, in other words, was not to provide finished shelters, but to support people in their own process of sheltering.[5]

THE TENSION

In the middle of May 2017, I took a trip to Stockholm to meet the IKEA shelter's design team and see how they navigated these two very different criticisms. I arrived at their headquarters on the 11th floor of the old Ericsson building in a southern suburb of the city, and spent some days learning about their brief, their aims, and their ways of thinking. The first thing that became clear

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4   For this reflection on the relationship with the Vitruvian virtues, I am grateful to Mark E. Breeze.

5   The critics do not even agree. Humanitarians have their biases; architects have theirs. I have written about this tension in the June 2017 issue of Forced Migration Review (Scott-Smith 2017).

was that this was not, in fact, an "IKEA shelter." It was a designed by a group of independent Swedish industrial designers who had met at college and developed the basic idea in discussion with humanitarians in Geneva. They later received substantial financial support from the IKEA Foundation, which allowed them to refine, test, and iterate the idea, eventually leading to a commitment from the UN Refugee Agency to

"...a fire safety test on the IKEA shelter."
PHOTO: MARK E. BREEZE.

purchase a large number of units.

As I learned more about the project, it soon became clear that the story of the shelter seemed to be constantly swinging like a pendulum. It was caught between the expansive utopian idealism that so often underpins the announcement of new humanitarian designs and the restricted, mundane implications of their actual implementation. Both types of criticism, in other words, were basically correct: the IKEA shelter is both 'too much' and 'too little'. It is clearly a product rather than a process, so it ends up being overwrought, top-down, and "too much" for aid workers who are skeptical of universal solutions. At the same time, it has been designed to be cheap and lightweight, so it will always be "too little" for those with bigger ideas about what design can achieve (especially as it lacks many of the basic elements that are crucial to architecture, such as proper flooring, insulation, light, strength, and beauty). The formal name for the shelter seems to encapsulate this tension. It is properly called the "Better Shelter", and I was reprimanded in Stockholm for using the name "IKEA

shelter," which remains in common parlance but has never been formally adopted.[6] This name emphasizes the restricted horizon of improvement. The product aspires to be better, but it is no more than shelter. It idealistically attempts to improve the world, but pursues this by providing basic shelter rather than engaging with a more expansive terrain of housing.

The problem of doing too much and too little was powerfully illustrated in December 2015, when the Swiss city of Zurich conducted a fire safety test on the IKEA shelter. The video of the test was screened on the news and subsequently circulated online: it featured a series of terrifying images in which a small fire, illuminating first the translucent sides of the shelter, suddenly engulfed the scene in an explosion of flames and molten plastic. The media picked up on the story, Zurich cancelled its intended use of the shelters for new migrant arrivals, and distribution of the shelter began to slow. This was perhaps the biggest challenge the design had faced since its inception, and the fire test led to more than a year of additional work as the team made changes to the shelter's design – mostly adjustments to the panel material. During this process, however, the design team found no clear code with which to work. Fire retardancy standards and testing procedures could not be found in the usual humanitarian handbooks, and so the team felt hostage to unrealistic criteria. The Swiss tests had compared the shelter with a permanent residential building, which seemed unfair (as a tent, which was the closest equivalent, would fare no better), yet it seemed impossible to object when the Swiss fire tests were released. The shelter was meant to be "better," and the whiff of double standards would drift over the scene very quickly if they argued this was a shelter for a different population. The idea that refugee accommodation should be held to lower standards would not be good publicity for a product so concerned with the promoting dignity.

The fire tests raised a number of questions. Is this a "slightly" Better Shelter? Or is it "sometimes" a better shelter, depending on location and context? And *when*, exactly, is it a better shelter – in which times and

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6 Its previous name was the Refugee Housing Unit (RHU), which made for a popular humanitarian acronym but was never very catchy. The rebrand as 'Better Shelter' tried to quash the use of "IKEA Shelter" completely, which is too reminiscent of corporate sponsorship.

places? One thing is clear: most people would not choose to live in one of these structures because of its obvious limitations. It has no floor or insulation, barely any natural light, and a tiny living space, even if its three or four tangible improvements certainly make it better than a tent. But then again, it *should* be better, as it costs a good deal more than a tent: currently twice the price of a UN High Commissioner for Refugees (UNHCR) standard family model. Is this a problem? Don't we expect a better shelter to be a more expensive shelter? Yet how much is too much? What if twice the price means aiding half as many people? Is this a "better" result?

As the IKEA shelter becomes more widely used in different locations, a clear lesson has begun to emerge: that the whole product is deeply dependent on context. It is only "better" in some times and places. It may be "better" when compared with a tent, but not when compared with a Swiss apartment building. It may be "better" in a Middle Eastern refugee camp, but not in a Western European reception facility. It may be "better" when funds are plentiful and refugee numbers limited, but not when refugees are plentiful and funds limited. It might be "better" when there is an urgent need for emergency shelters, but not when there is scope for people to build a home of their own.

THE LAGOM SHELTER

Perhaps this, in the end, defines the wider world of little development devices and humanitarian goods: they are simultaneously too much and too little. They are vulnerable to the charge of being too limited as well as the charge of being too expansive. They fail to tackle fundamental global injustices, but they still make numerous ideological assumptions about human life and human dignity beneath their search for modest improvements. The little development device oscillates between its grand visions of human improvement and its modest engineering in a tiny frame. The humanitarian good balances a philanthro-capitalist utopia with the minimalist aim of saving lives. All of this is encapsulated in the slightly Better Shelter. When I discussed these thoughts with the

THE UNHCR STANDARD FAMILY TENT.
SOURCE: UNHCR CORE RELIEF ITEMS CATALOGUE
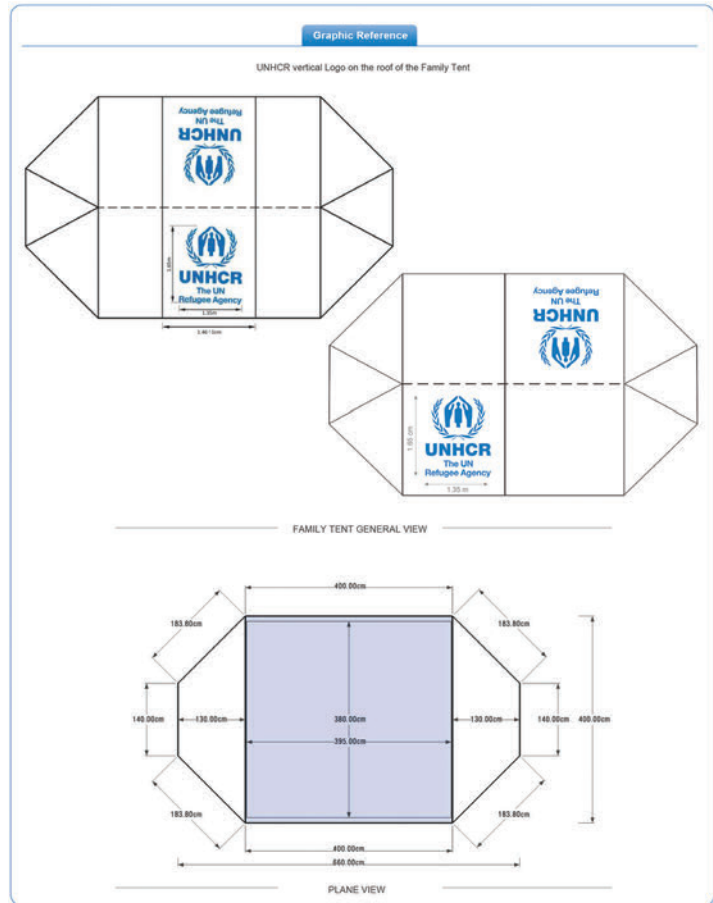
team in Stockholm, they basically agreed, and reached for the Swedish word *lagom* to describe their aims. It is tricky to translate, but means something like "the right amount," "neither too little nor too much." The Better Shelter is *lagom* because it has to be viable as well as adding value. It has to negotiate with the critics who claim it is "too much" as well as those who say it does "too little." The shelter could never please architectural critics because it was only designed as a cheap, short-term home, and it would

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7   IKEA have developed a Lagom project in recent years. See here.
8   For more on the political circumstances of the "no camp" policy in Lebanon, see Sewell and Alfred (2017).

never please bottom-up humanitarian practitioners because it was too top-down and complete. *Lagom* captures the search for balance while reflecting a wider ethos of democratic Swedish design.[7]

Yet aspiring to be *lagom* does not make the central tension disappear. Just like being "better," being *lagom* depends on context. What counts as "just enough" depends on where you are, who you are, and what you are doing. Something *lagom* in Sweden may not be *lagom* elsewhere. This became apparent just before the Better Shelter was launched, when a handful of units were shipped to Lebanon for a practical test with refugees. On their arrival in the Bekaa Valley, a group of armed and angry Lebanese neighbors appeared. The shelters, in their view, were too permanent. It did not matter that they had no foundations. It did not matter that they could be removed in less than a day. It did not matter that the walls and roof would degrade in just a few years. The structures were too solid, and the authorities agreed.[8] The Better Shelter had become "too much" for the Lebanese political context, just as in Switzerland it had become "too little." The same features that made it insufficient in one country made it extravagant in another.

So although the Better Shelter tries to be better everywhere, it can never hope to adapt to the infinite complexity of refugee crises and its scales became disrupted when butting up against hard political realities. Since 2013, the designers have been working assiduously in Stockholm to optimize every component: changing the clips and panel material, redesigning the bolts and vents, refining the door and frame. They think an improved product can overcome both the Swiss fire tests and the Lebanese resistance. But what is "better" will always change with context. The *Lagom* Shelter can only be truly *Lagom* on the 11th floor of the old Ericcson building in Stockholm. As soon as it moves, the balance changes. *Lagom* cannot be built into any universal form. ∎

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BIBLIOGRAPHY

Beazley. 2017. "Flat-packed refugee shelter named best design of 2016". Beazley Design of the Year Press Release, 26.01.2017. https://www.beazley.com/news/2017/winners_beazley_designs_of_the_year.html

Better Shelter. 2015. *Better Shelter: A Home Away From Home.* Better Shelter Promotional Leaflet. http://www.bettershelter.org/wp-content/uploads/2015/12/About_Better-Shelter.pdf

Davis, I. 1978. *Shelter After Disaster.* Oxford, UK: Oxford Polytechnic Press.

Garvey, P. 2017. *Unpacking Ikea Cultures: Swedish Design for the Purchasing Masses.* London, UK: Routledge.

Murphy, K. 2015. *Swedish Design: An Ethnography.* Ithaca, NY: Cornell University Press.

Scott-Smith, T. 2013. "The Fetishism of Humanitarian Objects and the Management of Malnutrition in Emergencies." *Third World Quarterly* 34(5): 913-28.

———. 2016. "Humanitarian Neophilia: The Innovation Turn and Its Implications." *Third World Quarterly* 37(12): 2229–2251.

———. 2017. "The Humanitarian-Architect Divide." *Forced Migration Review* 55:67-8.

Sewell, Abby, and Charlotte Alfred. 2017. "Evicted Refugees in Lebanon Have Nowhere Left to Run." *Refugees Deeply,* September 28. https://www.newsdeeply.com/refugees/articles/2017/09/28/nowhere-left-to-run-refugee-evictions-in-lebanon-in-shadow-of-return
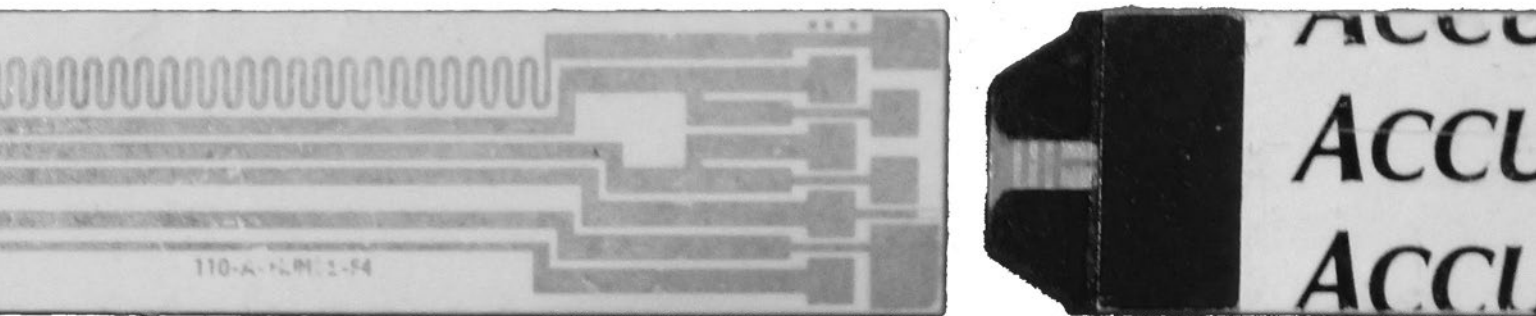
GLUCOMETER

THE LABYRINTH OF FOIL INSIDE A GLUCOMETER strip reveals a fragile chemistry. If you peel open the plastic covering, many inner circuits contain some version of biosensor technology, electrochemical cells screen-printed with gold or other precious metals and coated in places with enzymes. The foil serves as a conductor for electrons in a drop of blood, allowing a brand-matched glucometer machine to measure the charge a sample holds.[1] Yet costly design components (including gold) are also part of the reason that glucometer strips remain too expensive for most people in the world who have diabetes.

Today, personal blood glucose meters are widely considered best practice for optimal diabetes management. Key in calibrating safe insulin dosing, they have also become a vital part of how people with diabetes move in and out of numerical legibility: glucometers are playing a

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1   This is a gloss of one biosensor technique, described in lay terms to the best of my understanding, but various meters use many different variations of this technology that involve much further nuance. For detailed technical specifics of glucose biosensor technology, see "Glucose Biosensors" (Yoo and Lee 2010).

FOILS

Amy Moran-Thomas examines why diabetes patients worldwide still struggle to measure glucose.
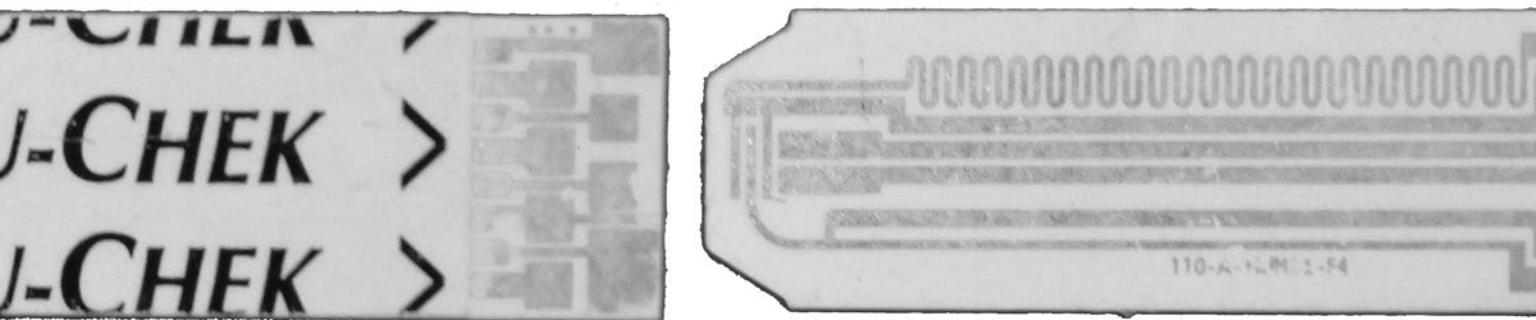
FIG 1.
Foil inside an opened glucometer strip.

major role in the piecemeal global public health mapping[2] of a diabetes epidemic rising worldwide. Even with increasing bureaucratic recognition, the number of people with diabetes remains debated by major policy institutions. The World Health Organization, author of the concerning map below (Fig. 2), calculates some 1.5 million fatalities from diabetes each year, while the International Diabetes Federation (IDF) places its projections even higher. Trying to account for undiagnosed populations, they estimate that diabetes now kills around 5 million people worldwide annually—five times as many as the reported mortality from HIV/AIDS in 2016—and that some three-quarters of an estimated 415 million diabetics today are living in low- or middle-income countries (IDF 2015). These very different statistics help to show the murky contours of a vast epidemic that glucometers' measures both enter and play a part in enacting (Mol and Law 2004). Yet their role in frontline diagnosis also hinges on a painful irony: glucometers' metrics help to make visible an enormous population of people living with diabetes in contexts of poverty, many of whom cannot consistently access the same meters then vital for day-to-day care.

I first encountered these issues as an anthropologist following people's stories about living with diabetes during a year of fieldwork in the

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2   Mapping the "global burden" of diabetes is very unevenly underway, as these statistics begin to suggest. Laboratory tests (such as fasting blood glucose or A1Cs) are more accurate to determine if someone has diabetes, since they provide a picture of glucose beyond the particular moment of testing. But these are much more logistically difficult than glucometer checks to realize outside clinics. Institutions currently rely on a patchwork of differently collected and missing data to estimate their diabetes projections, projects that raise their own conundrums (see IDF 2015).
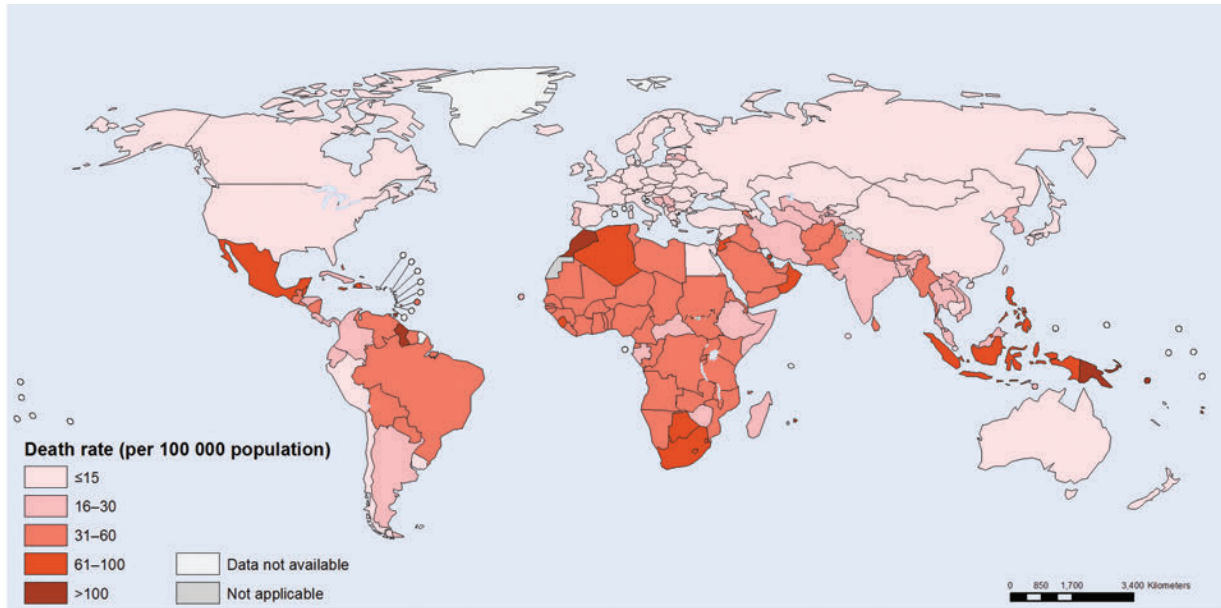
Death rate (per 100 000 population)

≤15
16–30
31–60
61–100   Data not available
>100   Not applicable

Central American country of Belize. It initially came as a surprise to me how expensive and out of reach the basic tools of glucose home management remained for many people I spoke with in 2010. During this time, glucometer machines—some purchased at grocery stores or local clinics, others acquired from visiting care groups or sent by relatives in the United States or elsewhere abroad—were priced around $50 to $100. Some corporations even provided them for free if you bought enough test strips, which are the truly expensive component of this system. Prices are declining today, but in 2010, they went for around $50 to $70 per jar of 50 strips (which would last less than a month for someone testing twice a day, but were often stretched much further by people trying to make supplies last). They had to be constantly replenished with imported strips that require precise matching to machine model and brand (Moran-Thomas 2016). A thriving gray market (Grondahl 2012) flourishes around them even in the national contexts they *are* specifically designed for, a problem reflected in the image I took recently in Pennsylvania (Fig. 3). According to a CNN report, in 2012 diabetes test strips became the number one most frequently stolen item in the United States, surpassing alcohol and cigarettes (and raising disturbing questions about the systems in place when a top target of criminalized theft is entwined with health-seeking behavior).[3]

Although glucometers first seem like the closest thing there is to a "solution in a box" (Redfield 2012a) for global diabetes management, as Peter Redfield (2012b) puts the quest for such objects, their upkeep entails engaging a transnational supply line full of expensive, complex parts and hardwired assumptions. Though portable, these devices require intricate networks to maintain: codes and calibrating fluid; lancets to draw blood from fingertips (for which some people substituted pins or sewing needles); and lithium and other specialized imported batteries, for which there was no substitute. Managing these messy assemblages could become a family affair, including the coordination of foreign insurance plans and mailed parcels. Certain models became easily damaged in hot temperatures, or left people trying to re-code their machine's time stamp, which might allow recently expired strips to come back into circulation. Many said a jar that expired a day or two ago could still work just as well, but no one knew exactly where to draw the line at when a strip's diminishing efficacy became too far expired to be worth consulting: A month? A year? Of course, drawing such lines returns to much larger unsettling questions around about glucose meters: How bad is less than ideal

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3   HLN News Now, CNN International Television; 7 June 2012.

generosity of relatives abroad or served as artifacts of transient philanthropic interventions, networks difficult to sustain day in and out. I saw countless machines that were unusable or broken. Time and again, I encountered malfunctioning meters with elaborate features such as Bluetooth compatibility on the shelves of homes without electricity, artifacts of vast gaps between the contexts these machines' designers envisioned and the places they have become necessary. Stored on kitchen shelves or carried in weathered plastic bags by patients trying to repair them, people's bodies and devices often seemed to be wearing out together.

There is a story about a critical crossroads in the history of meter development. It is an oral history that perhaps might be read as an aspirational rumor, but the story goes like this: There were two major competing companies shaping design when the first glucometer machines came out, one in England and another in Germany. A top employee of the British company has described how their engineers proposed making an open machine that would read either company's strip, and called their German counterpart with a proposal to coordinate. According to his recollections, the German company turned down the idea and did not want their strips read by any but their own machines (Mendosa 2006).

Although meters philanthropically donated by manufacturers today provide key islands of care in select low-income pockets of the world, such programs remain highly proprietary and heavily dependent on donor control, leaving huge populations excluded. There are also important efforts under way to distribute glucose meters that reflect the hard work and care of innovative grassroots communities in Belize and beyond, but such collectives still deal with devices that are prone to systemic breakdown and remain out of financial reach for many in the world. Scholars such as David Fidler (2008) have envisioned a productive "open source anarchy" that might characterize global health governance, in which private and public institutions alike could collaboratively contribute to building health networks and catalyzing competition to drive technological innovation. But the case of brand-matched strips and proprietary glucometer parts for global diabetes care seems more iconic of what Ruha Benjamin (2015) calls "discriminatory design," technologies with foreseeable injustices built in. (And like many

care—and how are people navigating its risks against the de facto dangers of no care? I wasn't sure what the implications of expiry backdating were in practice, but observed many cases in which refusing to fiddle with a meter would have meant no way to test at all.

Glucose meters were not designed to enter humanitarian aid economies. After all, diabetes had not historically been imagined as a worldwide issue of humanitarian concern. Decades ago in the 1970s when early blood glucometer models were first being developed in Europe, North America, and Japan, diabetes was still largely considered a "disease of affluence." Historically portrayed as linked to excess—if anything, the opposite of malnutrition—Type 2 diabetes was frequently cast as the responsibility of misbehaving individuals rather than a societal concern or urgent public health issue. Meanwhile, people with Type 1 were often mistakenly imagined scarcely to exist outside high-income contexts.[4]

In U.S. settings today, glucometers are often used in conjunction with continuous glucose monitoring systems or even insulin pumps. But these, to my knowledge, were not available in Belize even to the wealthiest, making a working "finger prick" meter more important as a checkpoint. For those who could acquire these digital devices, they commonly indexed the

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4 Though trimmed for space here, elsewhere this project unfolds in close dialogue with many other ethnographic and historical projects that also consider about how diabetic conditions are socially framed and materially enacted across distinct global contexts.

forms of discrimination, taken-for granted norms and complacencies that exclude certain populations from access can produce worrisome effects without being deliberately unjust.)

Is "discriminatory design" the inverse of humanitarian design? Humanitarian impulses express conscious intent to remedy injustices, whereas a glucometer's discriminatory effects seem to derive more from assumptions and failures of imagination. As Madeleine Akrich observes in her now-classic essay "The De-Scription of Technical Objects" (1992), it is often "only in the confrontation between the real user and the projected user [that] the importance of...the difference between the two [comes] to light," taking ethnographic work to "follow the device as it moves into countries that are culturally or historically distant from its place of origin" (Akrich 1992:211–212). When design problems for poor patients are identified, what happens next? As Alice Street discusses in this issue, point-of-care diagnostics have become a frontier of innovation for various global health projects. Yet glucose meters stand out as a boundary case example of technological design that has not been transformed by these new norms. Glucometers also serve for much more than one-time initial diagnosis of diabetes (though they at times play a diagnostic role): people then require access day in and out for the rest of a lifetime, if they hope to monitor their blood sugar in the ways their doctors recommend. Why have affordable, portable diagnostic tests for human African trypanosomiasis been developed and manufactured, but not for blood glucose?

Some people ask whether a satisfactory low-cost version of glucose testing already exists in urine strips (freighted with their own history of technical and ethical conundrums). Some of the first known technoscientific testing for diabetes was conducted with urine and bits of sheep's wool dipped in stannous chloride, which turned black to indicate the presence of sugar. Urine tests using paper steeped in alkaline indigo-carmine were in vogue by 1883, when *Bedside Urine Testing* was published in England (Clarke and Foster 2012). The messy material culture of boiling your own urine was finally replaced in the 1940s by an Ames company urine dipstick test for sugar, the Clinitest. It was based on the breakthroughs of dry-reagent chemistry (the technology behind litmus paper), and popularly marketed for home use.

Today's blood glucose machines are far more accurate than urine tests because they provide "real-time" blood glucose levels, whereas urine (by the time it's expelled) is reflecting the body's state several hours before. This, along with other limitations in precision, now makes blood glucose meters a basic standard of care for home testing in the United States. But out of recognition that such everyday glucometer testing remains utterly out of reach for many poor patients in huge swathes of the world, one of the IDF's important advocacy and policy engagements was to issue a position statement on glucose testing access. It boldly supported the
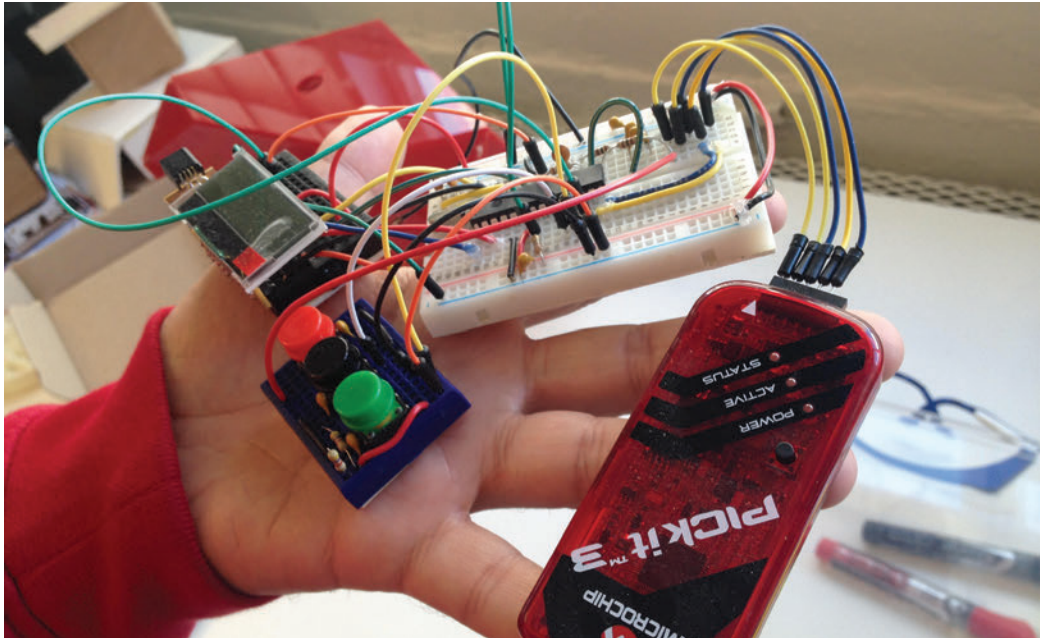
use of urine testing at home for diabetic people who could not afford personal blood glucose meters. The IDF's official position statement on urine glucose testing was publically issued in 2005. The three-page document reads in part:

> Before the advent of blood glucose monitoring in the 1970s, urine glucose monitoring was universally used, with many people able to maintain good control. Blood glucose monitoring has now replaced urine monitoring in resource-rich settings. However, insistence on blood glucose monitoring in economically disadvantaged settings could result in no monitoring at all...
>
> • Urine glucose monitoring should continue to be available throughout the world.
>
> • Education about its role and appropriate use should be part of essential education about diabetes for health care professionals and governments.
>
> • It can be used separately to, or in conjunction with, blood glucose monitoring in particular circumstances and settings.
>
> • It should continue to be included on the World Health Organization Essential Drugs List.

> • The major promotion by industry of blood glucose monitoring should not result in the appropriate role of urine glucose monitoring being underestimated.
>
> • As long as results are interpreted correctly, and limitations understood, it provides valuable information in persons with type 2 diabetes treated by diet or diet and tablets, in people with type 2 who use insulin, and in people with type 1 diabetes, who cannot afford blood glucose testing...
>
> • Because it is significantly cheaper than blood glucose monitoring, it has a very important role to play in settings where blood glucose monitoring is not accessible due to cost, or where blood glucose monitoring can only be done relatively infrequently. This occurs in some situations in both developing and developed countries.
>
> • Its use should be determined by the individual healthcare professional in conjunction with the person with diabetes, taking into account all circumstances.
> (IDF, 2005.)

The IDF affirms they have not updated this statement, though it is not widely publicized. (Perhaps this relates to diplomatic negotiations with glucometer manufacturers, key players in

diabetes policy arenas today.) Yet controversies about digital glucometer machines versus urine testing are also tangled up in much larger debates in global health ethics: When is outdated basic technology a stopgap measure for pragmatically addressing inequality in the meantime, and when does it risk normalizing complacency with unequal standards of care?

The glucometer's historical emergence in high-income contexts sets the stage for certain kinds of innovation being constrained around industrial players' concerns with retaining control of lucrative markets. Yet Akrich argues that it can be easy to believe such norms are unchangeable, which makes social history useful for opening up the contingencies of past designs and suggesting how their contours may be fiddled with ahead: "processes involved in building up the technical objects are concealed. The casual links they establish are naturalized. There was, or so it seems, never any possibility that it could have been otherwise" (Akrich 1992:222). Indeed, even market realities do not put to rest the larger questions also at play: Which inequalities trouble people into action or outrage, and which ones do not? Obviously there are unequal standards all over the place, but a few, like antiretroviral (ARV) availability to treat HIV/AIDS, became points of moral action. And like HIV/AIDS, diabetes also shares the market dilemmas of treatment for a lifelong disease that afflicts populations in both high- and low-income countries.

In the famous case of ARVs, alliances of patient advocates and national governments played major roles in using state laboratory capacities to put pressure on industrial players and make proprietary life-sustaining treatments more affordable. When it comes to diabetes hardware, a number of innovative projects (Akpan 2015) to design glucose management for people living in low-income settings are starting to get off the ground. One such effort is under way at the MIT Little Devices Lab (http://littledevices.mit.edu/), where I visited to learn more about work on "open design" by Jose Gomez-Marquez and his team. Studying the circuits of various glucose meters to figure out how they are wired, they envision an open device that could be useful for practitioners in his home country of Honduras or key collaborators in Nicaragua, for example, or a design blueprint that might be published online as a template for consideration by national laboratories in countries like Brazil that have the capacity to engineer their own

quality components. The Little Devices team has also begun exploring what they call "lost technologies" of diabetes care.

Such efforts are full of techno-ethical challenges, as Gomez-Marquez describes elsewhere (Mayo Clinic 2017). Yet they surely seem worth grappling with, given how uneven global diabetes care looks at present. In Belize at least, health workers I knew did not recommend urine dipstick tests for diabetes home care because they weren't considered best practice. But the stark reality persisted: poorer patients often had no way at home to test their sugar at all. Once I asked in a local clinic how they dealt with this quandary, and was surprised to find out that this simple alternative glucose test—costing pennies instead of dollars, and requiring no machine—had been right there on the clinic shelves all along. It turned out that the same urine dipsticks used to check for infections measured not only leukocytes, but also a row of other indicators, including nitrates, albumin protein, bilirubin, urobillinogen, pH levels, and—most important for diabetics—glucose and ketones, present in urine only when the body is off balance. There were numerous cardboard boxes filled with urine test strip jars in storage, a visiting nurse added; it was one of the few things they kept easily in stock. She invited me to look. "Intended for use in the U.S.A.," read the bottle's evasive label.

I twisted off the plastic lid and examined its contents, but they yielded no easy answers either—just little strips of rainbow colored patches, paper bands expiring in a jar. ∎

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BIBLIOGRAPHY

Akpan, Nsikan. 2015. "Weavers Turn Silk into Diabetes Test Strips." *NPR,* January 8. http://www.npr.org/sections/goatsandsoda/2015/01/08/375442225/weavers-turn-silk-into-diabetes-test-strips

Akrich, Madeline. 1992. "The De-Scription of Technical Objects." In *Shaping Technology/Building Society: Studies in Sociotechnical Change,* edited by W. L. Bijker, pp. 205–224. Cambridge, MA: MIT Press.

Benjamin, Ruha. 2015. "From Park Bench to Lab Bench: What Kind of Future Are We Designing?" [Video]. http://www.princeton.edu/research/news/faculty-profiles/a/?id=14608

Clarke, S. F., and J. R. Foster. 2012. "A History of Blood Glucose Meters and Their Role in Self-Monitoring of Diabetes Mellitus." *British Journal of Biomedical Science* 69(2):83–93.

Fidler, David. 2008. "A Theory of Open-Source Anarchy." *Indiana Journal of Global Legal Studies* 15(1). http://www.repository.law.indiana.edu/ijgls/vol15/iss1/11/

Grondahl, Paul. 2012. "Growing Diabetic Population Fuels a Black Market." *Albany Times Union,* January 30. http://www.timesunion.com/local/article/A-test-market-of-a-costly-kind-2794207.php

International Diabetes Federation (IDF). 2015. "IDF Diabetes Atlas, 7th Edition." https://www.idf.org/our-activities/advocacy-awareness/resources-and-tools/13:diabetes-atlas-seventh-edition.html

———. 2005. "The Role of Urine Glucose Monitoring in Diabetes: A Valuable Technology in Appropriate Settings." IDF Position Statement. Brussels, Belgium.

Mayo Clinic. 2017. "Jose Gomez-Marquez." Transform Conference 2017. https://transformconference.mayo.edu/speaker/jose-gomez-marquez/

Mendosa, David. 2000. "Meter Memories." *Diabetes Wellness Letter,* pp. 1–6.

Mol, Annemarie and John Law. 2004. "Embodied Action, Enacted Bodies: The Example of Hypoglycaemia." *Body & Society* 10(2–3): 43–62.

Moran-Thomas, Amy. 2016. "Breakthroughs for Whom? Global Diabetes Care and Equitable Design." *New England Journal of Medicine* 375: 2317–2319. http://www.nejm.org/doi/full/10.1056/NEJMp1611475

Redfield, Peter. 2012a. "The Unbearable Lightness of Expats: Double Binds of Humanitarian Mobility." *Cultural Anthropology* 27(2):358–382. https://culanth.org/articles/28-the-unbearable-lightness-of-expats-double-binds

———. 2012b. "Bioexpectations: Life Technologies as Humanitarian Goods." *Public Culture* 24(166):157–184.

Yoo, E.-H., and S.-Y. Lee. 2010. "Glucose Biosensors: An Overview of Use in Clinical Practice." *Sensors (Basel)* 10(5):4558–4576.

the HUMBLE COOKSTOVE

Meena Khandelwal and **Kayley Lain** reflect on half a century of failed efforts to change how people cook in rural India, before adding a little device of their own to the fire.

Across rural India the hand-crafted, biofuel cookstove, or *chulha*, has remained a ubiquitous feature of domestic life. Chulhas are generally cheap or free to construct and repair, are typically hand built from materials like stone and clay found in the local environment, and they use locally available fuels—solid, "mundane bioenergy" (Chatti et al. 2017) such as wood and crop residue—to heat water and cook food. They are an egalitarian technology. With a biofuel stove people need not depend on cash, fuel distribution networks, or hard-to-repair technologies to cook a daily meal. Meanwhile, both the activity of cooking on the chulha and the hearth itself are imbued with social and cultural significance. Fuel procurement and cooking may be experienced as drudgery but equally as sites of (primarily women's) autonomy and skill. The stove is a potent symbol of warmth, nourishment, and care; it imparts a delicious flavor to flatbreads (*roti*) and offers an important source of heat. Yet, for more than half a century, humanitarian-minded people and organizations have been preoccupied with the use of "biofuel cookstoves."

BIOFUEL AS PROBLEM

Biofuel stoves are targeted as wasteful, dirty, and dangerous. Experts agree that cooking with biofuel is an activity that requires development intervention and modernization, even though users themselves may prioritize other needs. One clear point of consensus is that cooking with biofuels indoors, over open flames, is very harmful to respiratory and pulmonary health (Smith 2000). At the household level, burning biofuel indoors is linked to emissions of smoke and particulate matter that harm the lungs, heart, and eyes. At the ecosystem level, fuelwood collection is linked to deforestation and the degradation of forest resources, as well as increases in the vulnerability of women to injury and sexual violence. At the planetary level, burning biofuel is linked to atmospheric carbon and global warming.

Despite an intense and longstanding

focus on rural cooking practices, there is no consensus regarding appropriate solutions. Some argue that from a health perspective, the only viable and just solution to the problem of biomass cookstoves is a massive investment in new infrastructure capable of bringing clean energy to rural people who have little expendable income (Smith 2002). In this view, all people should have access to clean cooking rather than to incrementally improved stoves that may reduce smoke but compare poorly with existing chulhas in functionality and durability.

Others argue for continued efforts to improve biofuel stoves. One reason is pragmatic: it is unlikely that the poorest people in the world will obtain access to alternatives any time soon, so biofuel gathered from the environment will continue to be the primary cooking fuel used by many for some time (Jagger 2017; Jagger and Jumbe 2016). A second reason to continue improving biofuel cooking technologies is that from a climate perspective, replacing renewable and locally sourced biofuel with fossil fuels—whether gas or electricity from coal-fired power plants—is hardly a desirable goal (Kikkeri 2017). If we factor in—rather than bracket out—the energy used for fossil fuel extraction and efficiency losses at every transfer point as it moves from source to household consumer, it becomes less clear that the use of locally available biofuel is a big problem. Rather than shifting to fossil fuel energy, it may be better, some say, to focus on reducing the stove emissions harmful to health and climate.

To this end, many actors with varied goals have tried to change the way rural people cook in developing countries by engineering, manufacturing, and distributing improved stoves. All such stoves aim to improve the lives of the energy deprived, and their intended beneficiaries are those people whose search for gathered—not purchased— fuel is a part of daily life (Yadama 2013) and who lack access to the cooking technologies preferred by wealthier families the world over, namely electricity and liquefied petroleum gas.

THE ENDURING PROJECT OF IMPROVING STOVES IN RURAL INDIA

In some regions of the world, improved biofuel stoves have diffused successfully. In rural India, however, massive efforts to replace the chulha with improved, clean, and efficient cooking technologies have not led to their widespread adoption (Chandrashekhar 2015; Khandelwal et al. 2017; Subramanian 2015). Among the countless improved stoves that have been introduced here we single out two distinct branches of design: the "smokeless chulhas" and the "high-efficiency cookstoves."

The smokeless chulhas reduce smoke inhalation by redirecting smoke out of a house through a chimney. In the early 1980s the Indian government funded training programs to construct and use one such smokeless chulha, the "Nada Stove," designed by Madhu Sarin and her Haryana village partners. The training programs, though ambitious in number, lacked sufficient resources and resulted in chulhas that were too tall, pot openings that were too small, and chimneys that didn't provide adequate draft to make the stove function properly. In addition, the introduction of chimneys in communities with thatched roofs introduced

FIG 1. This high-efficiency cookstove manufactured by Envirofit increases cooking efficiency but requires smaller diameter fuelwood, causes certain foods to cook unevenly or burn, and exposes children and cooks to burn risks. Spider webs and dust seen in the side view indicate this family has decided not to continue using this stove.

dangerous new fire risks (Chandrashekhar 2015). Reflecting on the process, Sarin (1986) described how village women were already improving their stoves, but when the government got involved, the massive scaling up and standardization of these improvements led to failure. In personal communication with us she further observed that the diversity of chulhas found throughout India is testament to the ways that poor rural users have long been modifying stoves, even if outside experts do not recognize such efforts as technological innovations. Non-literate village women are, and always have been, technological innovators.

By contrast, "high-efficiency cookstoves" such as the Envirofit stove (Figure 1) reduce emissions and wood usage by restricting the addition of wood to the fire, limiting heat loss, concentrating flames, and improving airflow (Dalberg Global Development Advisors 2013; Sinha 2002). These improved cookstoves often introduce other kinds of problems. Reductions in the size of the fuel opening to minimize heat loss, for example, require chopping large pieces of wood into smaller pieces, a time-consuming and laborious task. Adjustments intended to concentrate flames decrease the flexibility of the stove to accommodate cooking utensils for different meals. Stoves made of solid metal expose cooks and children to burn risks. Some models are so complex that villagers cannot fix them without specialized tools, resources, and knowledge. Most are too expensive for villagers to buy; for households living on a dollar a day, a high-efficiency cookstove can cost up to a month's income.

Where these new technologies have entered homes, generally due to the efforts of governments and nonprofit organizations, there is little evidence of long-term use. These efforts have raised questions about how best to measure "adoption." For example, research on long-term use in real-world settings suggests that the potential benefits of improved cookstoves based on testing in lab conditions "go up in smoke" when these new technologies fall into disrepair and disuse (Hanna 2016).

Puzzled by the persistence of efforts to replace the chulha in the face of repeated failure, we (Khandelwal et al. 2017) decided to step back and take a big-picture approach to understand this intense focus on stoves over and above other problems faced by the rural poor. What we found is that a variety of actors have focused on a set of intertwined goals: improving health, solving a fuelwood crisis, stemming deforestation, empowering women, and addressing climate change. As new concerns have arisen over the last hundred years, these have not displaced previous goals but rather accumulated over time.

The chulha is a condensed symbol with many different meanings. Cooking interacts with other aspects of rural life: technology, housing design, women's labor, availability of biofuel, seasonality and region, livestock grazing, labor migration, and cash income. Thus, it is inherently difficult not only to standardize improved stoves that will work in different contexts, but also to measure their impacts over time and across locations. Lab-based and top-down efforts to improve stoves have been frustrated by such complexities.

THE BIG AND SMALL OF IMPROVED STOVES

In January 2017 we (Khandelwal and colleagues) visited the Biomass Cookstove Test Centre at Maharana Pratap University of Agriculture and Technology in Udaipur, Rajasthan. This is one of four such centers funded by India's Ministry of New and Renewable Energy that certifies manufactured stoves for both business ventures and nonprofits. During our visit we watched an engineering student who had just passed her doctoral defense demonstrate the stove she had designed for use in rural India. In the next room a "no photography allowed" sign hung above neatly arranged rows of improved stoves, an indication of the proprietary interests attached to these models.

These improved stoves are all designed to be household technologies. They are small in size, portable, relatively simple, typically lightweight, and modestly priced. In India they are the flipside of the large-scale, capital-intensive projects such as mega-dams and power plants built to provide energy services to urban populations but that provoke critique and resistance for ignoring environmental concerns and the rights of those they displace (Baviskar 1995; Birkenholtz 2016). They are humanitarian goods in that they are inexpensive, scalable devices designed to alleviate suffering and save lives; they are also little development devices in that they envision social transformation by modernizing rural kitchens to improve human health, standard of living, and forest resources.

Stoves can be both gifts and goods. As

with solar lights and other technologies made for socially distant others, improved cookstoves slide easily between the categories of humanitarian gifts subsidized or given for free, and the humanitarian goods designed, patented, and sold by national and multinational corporations in the name of social entrepreneurship (Cross 2013).

Although some experts push for a market approach to improved stoves, many of the stoves manufactured by private companies are sold to humanitarian and development organizations that then offer them as gifts. Yet regardless of whether they are sold or given away, the improved stoves designed by experts who are socially removed from users continue to face the same obstacles to adoption and replicate the same lack of follow-through. Improved stoves are typically promoted by outsiders in a top-down mode rather than produced in response to demand on the ground. They are often promoted by powerful agents to save lives or to improve the welfare of people who lack access to modern energy infrastructure, such as those residing in rural areas or in hastily constructed refugee camps. Humanitarian and development efforts are plagued by lack of long-term investment because donors prioritize short-term projects, resulting in a chronic lack of attention to the repair and replacement of improved stoves.

There are many reasons that well-intentioned efforts to diffuse improved stoves have not succeeded in India, even when they can demonstrate (in a lab setting) reductions in fuelwood use and/or harmful emissions. These reasons have been well documented in myriad case studies. They include cultural dissonance, a mismatch between the goals of stove promoters and those of rural people, the poor performance of stoves that do not live up to big claims, the burden of buying new cooking vessels or chopping wood into smaller pieces, underestimation of the benefits of traditional chulhas that are easily built and repaired, and a poor implementation process (Khandelwal et al. 2017).

THE SMALL AND NONINTRUSIVE MEWAR ANGITHI

Given the problems encountered with smokeless chulhas and high-efficiency stoves, the staying power of the chulha is not surprising: it is naturally insulated to avoid burning a curious hand and to reduce heat loss to the surroundings, it is built to accommodate common cooking surfaces (*tavas* and pots) and meals perfectly, and it doesn't require excessive chopping of wood.

There is one inefficiency of the traditional stove, however: limited airflow. Placement of wood on the dirt floor of the stove limits the air available for combustion. During meal preparation, ash accumulates and smothers firewood and embers that break off from the wood. The energy in unburned embers is not effectively used for cooking, so more firewood is needed per meal; these embers also emit more smoke and harmful air pollutants as they smolder in the stove.

Is it possible to improve the three-stone hearth while preserving those aspects embedded in the cultural economy of the rural kitchen? This is the question that motivated a team of engineers and social scientists in a University of Iowa research group who, although fully cognizant of the problems plaguing improved stove programs, did not dismiss outright the potential for technological innovations introduced from the outside to improve people's lives.

Based on the principle that efficient combustion produces less smoke, they designed the Mewar Angithi (Figure 2), a simple steel grate inserted into existing chulhas (Udaykumar et al. 2015). Named after the region of Mewar where it originated, the insert improves airflow by creating a channel between the stove floor and firewood. This separates ash buildup that can smother unburned wood and catches larger embers,

FIG. 2. The Mewar Angithi, a simple metal grate insert, is designed to improve airflow to flames to improve combustion efficiency and reduce wood usage, cooking times, and particulate emissions.
SOURCE: REBECCA KAUTEN (TOP)
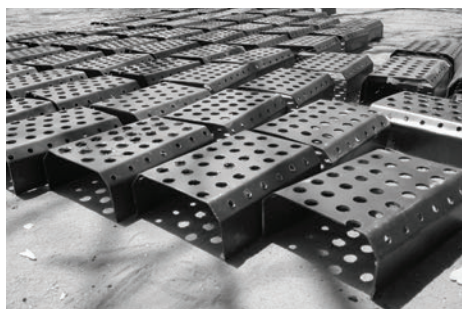
allowing them to combust more completely.

The engineers showed that without introducing any new obstacles, this simple addition to existing stoves compares in wood savings and particulate emissions reductions with the most efficient natural draft high-efficiency cookstoves on the market. Most important, the Mewar Angithi is affordable for most villagers at a cost of only a dollar, flexible in that it can be used with existing cooking technology, and durable because it lacks moving parts and delicate materials.

In tests conducted at the Biomass Cookstove Test Centre in Udaipur, the insert reduced wood usage by 63% and soot production by an impressive 89%. Seeing these results, all researchers involved were eager to deliver the device to villages and conduct more field tests. Could these results be produced in real kitchens? Could this reduce the time women spend collecting wood or smoke-related illness?

In 2015, Kayley Lain and Sailesh Rao arranged the distribution of 1,000 Mewar Angithi units in five Rajasthani villages to test the performance of the device in the field. A local steel fabricator produced the units and a nongovernmental organization (NGO) partner, the Foundation for Ecological Security, managed the distribution process. Testing these units in homes revealed an average of 33% reduction in wood usage in seven households. Particulate matter reductions as high as 51% were observed in one household with an average reduction of 33%, although these measurements involve many more variables than wood consumption and will require considerably more data to reduce uncertainty in these figures.

The engineering team conducted additional hybrid lab/field tests at the University of Iowa by building and testing a chulha using utensils brought from Rajasthan in an enclosed structure meant to replicate household conditions in a village; this method produced more data than observing daily cooking in village homes, but was more realistic than testing in ideal lab conditions. These tests showed a 31% reduction in large (~10 μm) particulate matter, which is in line with field data.

Lain and Rao surveyed village users six months after distribution and heard responses such as, "When I use the Mewar Angithi, smoke doesn't make my eyes water while I'm cooking." Many reported shorter cooking time (presumably due to hotter, more efficient fires) and reduced wood use.

In a sample of 80 households in Rajasthan who received these inserts, 71% reported using it daily, and none of the devices were damaged in any way (this was a serious problem with more complex improved stove designs). Some women reported that they do not collect wood as many times a week as they did before they received a Mewar Angithi. Those who chose not to use their inserts cited insufficient information upon receipt of the device or small chulha openings that could not accommodate the insert they received. Users reported the small device introduced no inconveniences and required no changes in their cooking practices. Compare this with the many obstacles imposed by improved stoves such as the Envirofit high-efficiency stove (described above).

MODEST DEVICES AS MODEL

The Mewar Angithi is a modest or humble cookstove device in several senses. First, much like the Zimbabwe Bush Pump described by de Laet and Mol (2000), it is small in ego and heroism. Inspired by common knowledge about elevating firewood to promote better airflow, this simple design claims neither patent nor ownership, nor is it imposed with admonitions of "dirty" cooking or grandiose claims about modernity.

Second, it is a technically simple device based on sound combustion principles; users should be able to easily observe how it works to improve airflow by allowing ash to fall through the holes of the insert and then, if necessary, modifying it by bending it to fit a smaller chulha.

Third, the process of implementation is also minimally disruptive to current cooking practices. Unlike the Bush Pump, this insert requires very little training and its adoption is at the level of household rather than village; this suits the Bhil households in southern Rajasthan because they are dispersed across the landscape and cooking occurs at the household level. Users can also easily remove the insert if desired because installation only requires placing it in an existing stove (right-side up).

Fourth, it has the potential to be a "fluid" technology with vague and shifting boundaries (de Laet and Mol 2000). It is easily adapted (to fit a small stove) and reproduced with minimal capital and technical knowledge, which makes it unsuitable for humanitarian entrepreneurship and market logics (Redfield 2016). It is also very much like the grates integral to many improved

wood-burning stoves, so it simply takes one feature of many improved stoves that can be inserted into any chulha to "improve" it. In principle, it can be made with clay rather than steel.

The design is simple and flexible enough to be manufactured and diffused in localities around the world, which can also provide economic opportunities in small communities. Fabio Parigi and Michele Del Viscio have already sparked insert manufacturing at a school in Nyumbani, Kenya, where students were able to make their own stove inserts with tools available to them in the village (Parigi et al. 2016). Ongoing efforts to collect data about cooking practices and impacts should improve our understanding of the insert's ability to reduce harmful emissions and wood consumption. However, its fluid characteristics also make it difficult to measure impacts on health, environment, and social relations.

The Indian chulhas that remain ubiquitous throughout rural India, despite humanitarian efforts to render them obsolete, are custom made for each home and vary depending on climate, regional food, size of utensils, and other factors. One reason for the failure of previous improved stove programs is that standardization and scaling up introduce their own problems. Small, technically modest devices such as the insert are more likely to support a foundation of indigenous and local participation in the process of generating and applying new technical knowledge.

A small, steel fireplace grate that can be inserted into most existing stoves or adapted to fit is more likely to diffuse via influence; this means technical adjustment to fit user needs can be an organic part of the diffusion process. Though we have called it the Mewar Angithi, this device, which carries no patent or trademark, can also simply be called a "stove insert" or "stove grate." This little device, modest as it is, makes a bold claim about how people might design and diffuse humanitarian goods in ways that have the potential to democratize "expertise" and undermine the market logic that has shaped both humanitarian and development efforts to modernize cooking practices in rural India.

THE HUMBLE FUTURE

Despite renewed efforts to transform the cooking practices of people in rural India, we suggest that humble cookstove interventions will remain important.

In 2016, India's Ministry of Petroleum and Natural Gas rolled out the Pradhan Mantri Ujjwala Yojana program, which offered free connections and subsidies for gas cylinders to families living "below the poverty line." Though this scheme is ambitious and will no doubt move many households away from biofuel, the shift will be neither easy nor total. Women in remote parts of rural India, for example, must rely on men's help to take gas cylinders to towns on public transport or motorcycles for exchange, but their men may not consider it worth their time to get the refill. By contrast, women do not need to rely on men to collect fuelwood.

If India's past holds any lessons, those who have gained the least from large-scale infrastructure projects related to energy due to their geographical, political, and/or economic marginalization are also least likely to benefit from the government effort to make clean cooking fuel ("clean" at the point of cooking) available to all. Many Bhil villages in southern Rajasthan, our research suggests, will continue to cook with biofuel on their chulhas for some time to come. ∎

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BIBLIOGRAPHY

Baviskar, Amita. 1995. *In the Belly of the River: Tribal Conflicts over Development in the Narmada Valley.* Delhi, India: Oxford University Press.

Birkenholtz, Trevor. 2016. "Dispossessing Irrigators: Water Grabbing, Supply-Side Growth and Farmer Resistance in India." *Geoforum* 69:94–105.

Chandrashekhar, Vaishnavi. 2015. "Up in Smoke: Why India is Still Looking for a Perfect Cookstove." The Caravan: a Journal of Politics & Culture. April 2015 issues. http://www.caravanmagazine.in/reportage/smoke-india-perfect-cookstove/2

Chatti, Deepti, Matthew Archer, Myles Lennon, and Michael Dove. 2017. "Exploring the Mundane: Towards an Ethnographic Approach to Bioenergy." *Energy Research & Social Science* 30:28–34.

Cross, Jamie. 2013. "The 100th Object: Solar Lighting Technology and Humanitarian Goods." *Journal of Material Culture* 18(4):367–387.

Dalberg Global Development Advisors. 2013. *Global Alliance for Clean Cookstoves: India Cookstoves and Fuels Market Assessment.* Presentation. http://cleancookstoves.org/resources_files/india-cookstove-and-fuels-market-assessment.pdf

de Laet, Marianne, and Annemarie Mol. 2000. "The Zimbabwe Bush Pump: Mechanics of a Fluid Technology." *Social Studies of Science* 30(2):225–263.

Hanna, Rema, Esther Duflo, and Michael Greenstone. 2016. "Up in Smoke: The Influence of Household Behavior on the Long-Run Impact of Improved Cooking Stoves." *American Economic Journal: Economic Policy* 8(1):80–114.

Jagger, Pamela. 2017. "2017 Provost's Global Forum: Women's Health and the Environment: Going Up in Smoke." Paper presented at the 2017 Provost's Global Forum "Women's Health and the Environment: Going Up in Smoke", University of Iowa, Iowa City, April 14, 2017.

Jagger, Pamela, and Charles Jumbe. 2016. "Stoves or Sugar? Willingness to Adopt Improved Cookstoves in Malawi." *Energy Policy* 92:409–419.

Khandelwal, Meena, Matthew E. Hill, Jr., Paul Greenough, Jerry Anthony, Misha Quill, Marc Linderman, and H. S. Udaykumar. 2017. "Why Have Improved Cookstove Initiatives in India Failed?" *World Development* 92:13–27.

Kikkeri, Ramesh. 2017. "Swami Vivekananda Youth Movement Experience with Cookstoves in South India." Paper presented at the Fulbright-Hays GPA Workshop, Udaipur, Rajasthan, January 7, 2017.

Parigi, F., M. D. Viscio, S. Amicabile, M. Testi, S. Rao, and H. S. Udaykumar. 2016. "High Efficient Mewar Angithi Stove Testing in Rural Kenya." Paper presented at the 7th International Renewable Energy Congress (IREC). Dates 22–24 March, 2016, in Hammamet, Tunisia.

Redfield, Peter. 2016. "Fluid Technologies: The Bush Pump, the LifeStraw and Microworlds of Humanitarian Design." *Social Studies of Science* 46(2):159–183.

Sarin, Madhu. 1986. "Improved Chulha Programme: Boon or Disaster?" *Economic and Political Weekly*, XXI(38–39):1709–1717.

Sinha, B. 2002. "The Indian Stove Programme: An Insider's View—The Role of Society, Politics, Economics and Education. *Boiling Point* 48:23–26.

Smith, Kirk. 2000. "National Burden of Disease in Indian from Indoor Air Pollution." *Proceedings of the National Academy of Sciences of the United States of America* 97(24):13286–13293.

———. 2002. "In Praise of Petroleum?" *Science* 298(5600):1847.

Subramanian, Meera. 2015. *A River Runs Again.* New York: Public Affairs.

Udaykumar, H. S., A. Kindig, S. Rao, M. Del Viscio, V. Kukillaya, N. Panwar, and D. Sharma. 2015. "How a Simple, Inexpensive Device Makes a Three-Stone Hearth as Efficient as an Improved Cookstove." *The Solutions Journal* 6(4):53–60.

Yadama, Gautam N. 2013. *Fire, Fuel and the Fate of 3 Billion: The State of the Energy Impoverished.* New York: Oxford University Press.
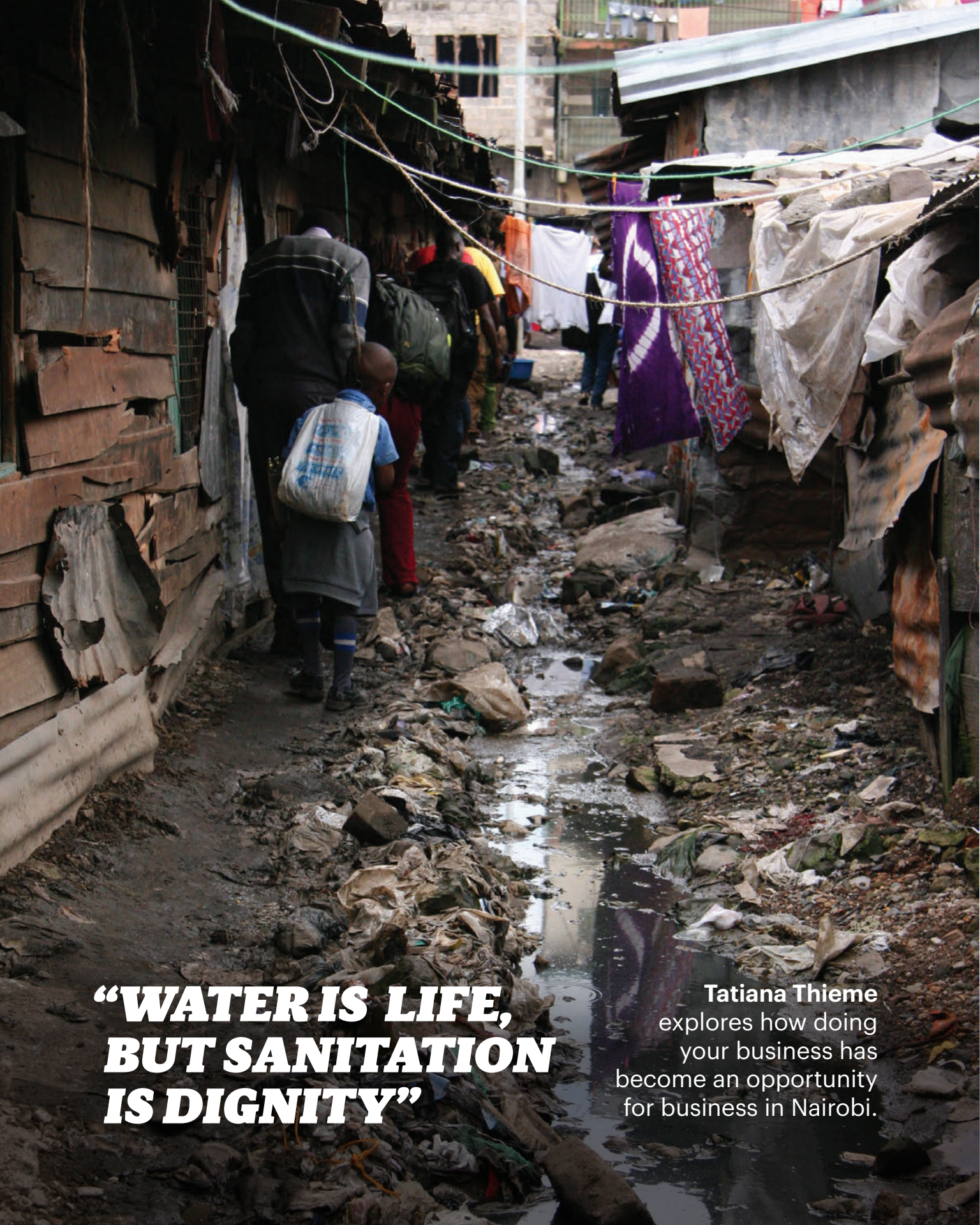
"WATER IS LIFE, BUT SANITATION IS DIGNITY"

Tatiana Thieme explores how doing your business has become an opportunity for business in Nairobi.

T he IkoToilet, meaning "Here is the toilet" in Swahili, is a Nairobi-wide public–private sanitation intervention that aims to address the lack of adequate sanitation options across the city. The core of IkoToilet's model—pay-per-use public toilets—is by no means new. By turning the basic need into an experience of leisure and consumption, however, the IkoToilet aims to challenge the idea that the toilet is an unsuitable place to visit, use, let alone to hang around (Thieme 2010). IkoToilets are intended to provide a significant step-change in the quality of public toilets and to seed a drastic rise in common expectations concerning construction, maintenance, and cleanliness of public toilets.

Each IkoToilet facility is owned by EcoTact, a social enterprise that "invests in innovations to solve sanitation crisis in Africa and beyond." Each IkoToilet has the same distinctive design, same construction, same color scheme, same branding, and, in theory at least, is maintained and cleaned to the same high standards. In addition to the toilets, IkoToilet facilities may also include a row of shoe-shining stations and a small kiosk for the sale of snacks and drinks that are rented out to "microentrepreneurs." Each IkoToilet also includes "billboard" space, with advertising placements available above, outside, and inside the toilet. Revenue from microenterprise and advertising contributes to EcoTact's return on investment.

REINVENTING THE TOILET

With more than 50% of people in the world now living in cities, one of the starkest paradoxes of modernity is reflected in the statistic that more people in the world today have access to a mobile phone than a safe and clean toilet (United Nations 2013). As such, the toilet has become both the symbolic and material locus for addressing water and sanitation poverty, framed by United Nations (UN) Sustainable Development Goal 6.

The toilet has put the "unmentionable" (George 2008) on the map of development and humanitarianism. It has concentrated calls for collective attention in a singular, tangible object. For development organizations,

LEFT: Mathare alley way between houses, 2010. PHOTO: CLAUDIA PURSALS

an emphasis on the toilet has been effective in raising a broader set of questions and problems, from the spatial, material, and embodied practices of sanitation and the concerns for personal privacy, safety, and separation from disease vectors to the diversity of toilet designs. Most important, attention to the toilet as an object has called for the design and distribution of new toilets—"little development devices"—that can provide access to improved sanitation while further deferring large-scale infrastructural development in cities already marked by considerable uneven urban planning.

In the last 10 years international concerns with water and sanitation have turned Nairobi into a laboratory for the toilet. In the city's low-income settlements inadequate sanitation is normalized, a social fact captured by the common refrain, "Diarrhea *ni kawaida* (is normal)". The toilet has become the quintessential technical development problem in search of a fix (Li 2007), with toilet projects spanning the field of design, engineering, and digital technology. The toilet sits at a confluence of concerns with infrastructure and planning, hygiene, and social patterns of cleanliness, health outcomes, and the provision of cleaning services and has come to occupy new constellations of government and nongovernmental actors. Across Nairobi development practitioners, community activists, academics, and, increasingly, social entrepreneurs (business people who identify themselves with "social innovation" or "social business") now "give a shit" about sanitation. Here the reinvention of the toilet is no longer simply a public health imperative or an ecological design challenge; it is also a business opportunity.

In Nairobi, a combination of approaches has produced a portfolio of privatized, imperfect, but functioning alternatives to nonexistent or inadequate government infrastructure and delivery (Bohnert et al. 2016). Yet, because these interventions are all public, communal, or shared toilets, they have all been obliged to confront and work off of existing infrastructures and social norms. These interventions all depend on communities taking an active role in improving their sanitation options. They all need to work within (not necessarily presume to undo or move beyond) the very real urban

constraints and pragmatic coping strategies related to compact and modular living.

These interventions have practically and rhetorically turned the toilet into a development device. A range of off-grid toilets—from Ecotact's IkoToilet hardware-franchise model to an eco-sanitation model (Sanergy's Fresh Life Toilet)—have shifted attention away from the possibility of large-scale networked infrastructural improvements toward the everyday micro-politics of sanitation (Thieme 2015). These toilets reflect particular claims about the ability of specific market-based interventions to address sanitation poverty and have set in motion a series of narratives that make these claims travel globally.

But what kind of toilet should be promoted?

THE SANITATION PROBLEM

In December 2009, a group of private sector individuals, nongovernmental organizations (NGOs), and community-based entrepreneurs gathered at the PanAfric Hotel in Nairobi for a meeting hosted by the World Bank's Water and Sanitation Programme to discuss the management of public and community toilets in the city of Nairobi. "Water is life, but sanitation is dignity," said the moderator in his opening remarks.

Two years later, in February 2011, more than 100 residents from Mathare, one of Nairobi's oldest and largest informal settlements, gathered in a community hall for an event hosted by a citizen-led geographic information systems (GIS) mapping initiative called Map Mathare to define their priorities. Run as a participatory workshop, the breakout groups reported back with various themes that were then clustered, and finally the facilitators asked that two dominant themes be identified so all

the trained community "mappers" could start plotting the GIS points of the landmarks representing these two themes. Near the end of the three-hour workshop, note cards were pinned to the wall in the front of the room representing the two preferred areas of concern within each breakout group. Each card mentioned health as one, and water and sanitation as the other.

How can the lack of adequate sanitation infrastructure in the city and especially in Nairobi's low-income residential areas be addressed? These two events reflected the gaps in perception and experience as institutions and grassroots groups set out to address Nairobi's "sanitation problem."

The event held at the PanAfric Hotel stressed two points: the heightened demand for more public and community toilets, and the increasing interest in enterprise-led approaches to tackling challenges of urban poverty. Although the individuals present at the meeting came from different sectors, with the private sector as a minority, the consensus was that, as one person brazenly put it, "Shit is big business!"

In contrast, at the grassroots community event in Mathare, the issues raised stemmed from a deeper reflection. Mathare's toilet blocks are a metonym for many of the surrounding problems related to urban services facing this mosaic of impoverished and marginalized neighborhoods. In the discussion, community members reflected on the multiple aspects of the sanitation challenge (including issues of land tenure, infrastructure, and social behavior) as well as a recognition that it would never be enough simply to agree on the need

for more toilets. Here public toilets and the toilet block were part of a commons. As David Waithaka, founder of the community-based NGO Mathare Association, put it, "In Mathare there are very few things that can be said to serve the public good. There is no community hall; there is no secondary school. But one of the things that you could say, *it is ours, it belongs to us,* is the public toilet."[1]

These two events reflect the ways in which the problem of sanitation is being mobilized in Nairobi. The development sector presents sanitation as a site of entrepreneurship, and sees market opportunities including job creation and private service provision. Meanwhile, sanitation activists see opportunities for community mobilization, claiming basic urban services as a human rights issue. Although sanitation entrepreneurs operating in the hustle economy "make do" under conditions of adversity and see the absence of public services as an income opportunity for private providers (Thieme 2015; 2017), sanitation activists mobilize against and call out the absentee state (Appadurai 2001).

THE PUBLIC TOILET
In the single-room homes of Mathare, the toilet is a luxury good and a distant reality. For most low-income households, the home is purposefully modular. The "bedroom" becomes at different points in the day the kitchen, the sitting room, the work station for in-home businesses, the after-school homework study area, and the site of assembly for self-help groups discussing their saving scheme. The bathing corner is used for cooking one minute, washing your feet the next. The toilet is set apart from the home not only because it is more convenient, but because it is also considered more hygienic to keep your ablutions far away from your dwelling, despite the very real security concern, particularly for women and children, of a long walk to the nearest toilet after dark (Amnesty International 2010).

These shared or "public" toilets (a reality for most of Nairobi's citizens) reveal the multifarious considerations related to the building, maintenance, management, access, and financing of ablution blocks, along with the often less documented but crucial everyday investments of social life that make a common resource work for and serve the needs of multiple end users (Thieme 2015).

First, the public toilet block serves as a proxy for the self-contained toilet that people in the community don't have at home, turning private bodily practices into a shared affair.

Across Nairobi's low-income settlements the toilet has come to showcase moments of "excessive attention" (Simone 2010:40), whether through externally sponsored rehabilitation schemes or protests aimed at symbolizing dire infrastructural dilapidation. From Mathare to Kibera and Korogocho, the rehabilitation of public toilets has been a highly visible affair, undertaken with sponsorship from the German Embassy, U.S. Agency for International Development (USAID), United Nations Environment Programme (UNEP), and the World Bank's Water and Sanitation Programme, as well as local NGOs. Despite the commemorative plate on the outside wall featuring a date and the name of a sponsor, these sanitation prestige projects often appear to give little thought to their sustainable management, and they are often ill maintained or falling apart.

Meanwhile, against the backdrop of rapid and often makeshift urbanization among low-income urban citizens, toilets and the sanitation commons have become highly politicized spaces in Nairobi and beyond (McFarlane et al. 2014). In South Africa's "poo wars," for example, protesters against township sanitation poverty dumped human waste on the steps of City Hall to make public the inadequate and often ignored infrastructural politics (McFarlane and Silver 2016; Redfield and Robins 2016; Robins 2013).

In Nairobi too, toilets in informal settlements have become an integral part of urban poverty politics. In neighborhoods like Mathare, toilets have come to exemplify the deliberations and potential tensions related to the commons; the demolition of that "public good" becomes grounds for political mobilization.[2]

A BEAUTIFUL TOILET
In 2008 EcoTact installed an IkoToilet in Mathare, the first and only installation to date in one of Nairobi's low-income settlements. The Mathare IkoToilet was launched with much fanfare, with the company claiming that the community would discover the benefits of "hygienic public utilities" if one builds a "beautiful toilet" (http://www.ikotoilet.org) and would pay for monthly membership. It was established on what EcoTact described as a "more equitable" membership model rather than a pay-per-use model. Under the model, households were invited to buy a "membership card" for KES 100 (USD $1.35), which allowed them a month's access to the toilet. The toilet was meant to be self-sustaining, with revenues from memberships and UV-filtered municipal water sales paying salaries and other operating expenses. EcoTact pitched the IkoToilet as a community hub for other economic and social activity, with the prospect that it would open up other revenue and impact opportunities.

The location of the IkoToilet in Mathare, however, was far from ideal. In such a densely populated community, finding a plot large enough to build an IkoToilet was no small feat.

Being selective about its location would have delayed the project for years and would have certainly driven up

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1   Interview with David Waithaka in front of Kambi Motto public toilet, Mathare, May 18, 2010.
2   The Member of Parliament (MP) of the constituency in which Mathare is situated, for instance, made public toilets integral to her political platform.

costs, so the toilet was built in an area called Kosovo, off a secondary road, behind three rows of homes, where it was poorly visible.

Some 300 meters away from this location was an open field that the neighboring community had always used for free (if risky) open defecation. Without a significant marketing/education/awareness campaign to sensitize the community, potential IkoToilet members, to the dangers of open defecation and the benefits of a clean, high-quality toilet, that field remained the community's primary toilet and undercut IkoToilet. The assumption that everyone would recognize the IkoToilet as a significantly better, "more dignified," safer, and ultimately less expensive option was overly optimistic.

Ecotact's challenges in Mathare appeared to demonstrate that improving sanitation in a low-income urban settlement could not be approached only from an infrastructure, "hardware" angle (Kar 2005). Yet the impact of its IkoToilet, measured against the company's objective of raising the profile, awareness, and expectations of public toilets, was positive. The installation in Mathare generated national and international discussion about public sanitation. By 2010, EcoTact had built 40 other IkoToilets across Nairobi, including installations in Nairobi's central business district and other high-traffic, high-volume, higher-income areas. The company pointed to IkoToilet's success in these areas as proof that its toilets could be positive communal points and centers for various economic and social activities, and its reputation grew.

THE FRESH LIFE TOILET

A more recent and perhaps more comprehensive solution to Mathare's "sanitation crisis" has been led by another Kenyan-based eco-sanitation social enterprise: Sanergy. In 2011 Sanergy received funding from the Bill and Melinda Gates Foundation through their Reinvent the Toilet Challenge to build a "sustainable sanitation value chain model" in two of Nairobi's largest informal settlements (Chonghaile 2012). In line with the terms and conditions of the Reinvent The Toilet Challenge, Sanergy's prefabricated toilets (known as Fresh Life Toilets) do not require connections to water or sewer infrastructures and are set up as local franchises, with local residents (known as "Fresh Life Operators") purchasing and operating the facilities, and with mobile waste collectors (known as the "Fresh Life Frontline" team) collecting filled "cartridges" and replacing them with empty ones, ensuring the regular removal of "shit".

The team behind Sanergy studied IkoToilet, and their model is designed to be a holistic solution by both installing new shared toilets in neighborhoods with high demand, removing the waste from the community, and promoting job creation in local economies with high rates of underemployment.

Fresh Life field officers and customers have raised other questions about the installation and maintenance costs. In addition to those costs, a common grievance is that some local residents are uncomfortable "shitting in a blue plastic barrel" where their waste remains "in place" until it is collected, and having to pay a higher fee than they are accustomed to. Other local residents have remarked that Sanergy's claim to produce "organic waste" at the end of the value chain is an unrealistic expectation, with farmers outside the city unlikely to want to buy fertilizer "made from the shit that comes from the slums."[3] Two Sanergy Fresh Life toilets were built inside a primary school in Village 4A, one of the poorest areas of Mathare. One third of all the school's children are orphans; when I visited the school in 2016, the head teacher explained that a benefactor paid for the installation of the toilets, but the school was struggling to meet the annual service fee because most children do not pay school fees.

Here Sanergy faces a dual challenge: turning a public health need into a market with a payable demand, and confronting the cultural taboos associated with human waste (Thieme 2015).

BOTTOM-UP INNOVATION

One common thread across these and other private sector–led sanitation interventions in Nairobi is a concern to produce "empowered" sanitation subjects: people who might serve as beneficiaries, customers, entrepreneurs, community health officers, "natural leaders," or facilitators in partnership with sanitation companies. In some cases, the end user is a citizen recipient of the right to better sanitation. In other cases, the end user is an agent of improvement. In all cases, the end user becomes a "consumer-client" of a given facility, service, or product offering.

As they navigate these roles, people's responses to the problem of sanitation necessarily vacillate between public and private action. In questions of maintenance, management, and payment it can appear a matter for consensus. Public, shared, or communal toilets are inextricably tied to community economics and the quotidian, often invisible, labor involved in maintaining these sanitation commons. Collective action might involve establishing a willingness to pay a private sanitation provider, or resolving the disputes that inevitably occur when any group of people share a common resource (Thieme and DeKoszmovszky 2012). Meanwhile, everyday sanitation practice no longer only involves making a choice between defecating in open spaces or in a shared latrine; it now also involves oscillating between the private actors who sell or provide sanitation as a service in the absence of fully public infrastructure.

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3   These insights are based on a series of unstructured interviews and informal conversations with the Fresh Life field officer, a primary school head teacher, and public health community organizer in Mathare during field trips in 2012 and 2016.

As little development devices, the toilets installed in Mathare are shaping and reworking sanitation experiences and relationships. But these toilet projects might, in turn, shape future innovations "from the bottom up" by providing a useful extension and reorientation of current critiques of market-led development discourse and practice.

Nairobi's sanitation solutions set out to render formerly public services as privately delivered goods, producing entrepreneurial subjects, turning social needs into market demands, and appending public health messages to consumer products (Cross and Street 2009). But they also demonstrate how, if they are to be successful, future interventions at this nexus of public health and social entrepreneurship must address people's perceptions and experiences of sanitation spaces, from the shared latrine to the sites of open defecation. In Nairobi, the low-income public toilet is not just an engineering challenge or an entrepreneurial project; it is a place, situated within the broader struggles of the ablution block. ■

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BIBLIOGRAPHY

Amnesty International. 2010. *Insecurity and Dignity: Women's Experiences in the Slums of Nairobi, Kenya.*

Appadurai, Arjun. 2001. "Deep Democracy: Urban Governmentality and the Horizon of Politics." *Environment & Urbanization* 13(2):23–43.

Bohnert, K., Anna N. Chard, Alex Mwaki, et.al. 2016 "Comparing Sanitation Delivery Modalities in Urban Informal Settlement Schools: A Randomized Trial in Nairobi, Kenya." *International Journal of Environmental Research and Public Health* 13(12):1189.

Chonghaile. Clar Ni. 2012. "From Flying Toilets to Fertiliser, Slum Sanitation in Nairobi Is Changing." *The Guardian*, November 19. https://www.theguardian.com/global-development/2012/nov/19/flying-toilets-fertiliser-slum-sanitation-nairobi

Cross, Jamie and Alice Street. 2009. "Anthropology at the Bottom of the Pyramid" *Anthropology Today*, 25(4):4-9.

George, Rose. 2008. *The Big Necessity: Adventures in the World of Human Waste.* London, UK: Portobello Books.

Kar, Kamal, and Katherine Pasteur. 2005. "Subsidy or Self-Respect? Community Led Total Sanitation." *Institute of Development Studies*, Working Paper 257, pp. 1–62.

Li, Tania Murray. 2007. *The Will to Improve: Governmentality, Development, and the Practice,* Durham, NC: Duke University Press.

McFarlane, C., R. Desai, and S. Graham. 2014. "Informal Urban Sanitation: Everyday Life, Poverty, and Comparison." *Annals of the Association of American Geographers*, 104(5):989–1011.

McFarlane, C., and J. Silver 2016. "The Poolitical City: 'Seeing Sanitation' and Making the Urban Political in Cape Town." *Antipode* 49(1):125–148. doi:10.1111/anti.12264

Redfield, Peter, and Steven Robins. 2016. "An Index of Waste: Humanitarian Design, 'Dignified Living' and the Politics of Infrastructure in Cape Town." *Anthropology Southern Africa* 39(2):145–162. doi:10.1080/23323256.2016.1172942

Robins, S. 2013. "How Poo Became Political." *The Cape Times* (Cape Town), July 2, p. 9.

Simone, Abdoumaliq. 2010. *City Life from Jakarta to Dakar.* New York: Routledge.

Thieme, Tatiana. 2010. "Youth, Waste and Work in Mathare: Whose Business and Whose Politics?'' *Environment and Urbanization* 22(2):333–352.

Thieme, Tatiana. 2013. "The 'Hustle' Amongst Youth Entrepreneurs in Mathare's Informal Waste Economy." *Journal of Eastern African Studies* 7(3):389–412.

Thieme, Tatiana. 2015. "Turning Hustlers into Entrepreneurs, and Social Needs into Market Demands: Corporate-Community Encounters in Nairobi, Kenya. *Geoforum* 59:228–239.

Thieme, Tatiana. 2017. "The hustle economy: Informality, uncertainty and the geographies of getting by." *Progress in Human Geography.* Online first at https://doi.org/10.1177/0309132517690039

Thieme, Tatiana, and Justin DeKoszmovszky. 2012. "Community Cleaning Services: Combining Market- and Donor-Based Approaches to Urban Sanitation and Youth Engagement." Field Action Science Reports (FACTS). Paris, France: Institut Veolia Environment.

United Nations. 2013. Deputy UN chief calls for urgent action to tackle global sanitation crisis. http://www.un.org/apps/news/story.asp?NewsID=44452&Cr=sanitation&Cr1=#.Wjb7urTQrOS

RATIONAL
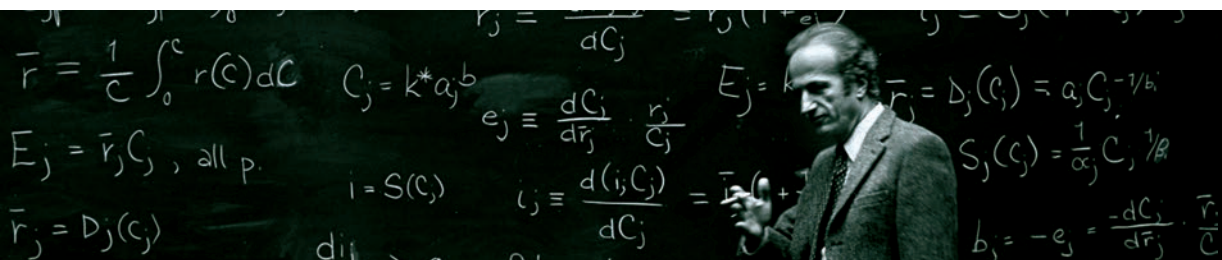
ABOVE:
Economist
Gary Becker
UNIVERSITY OF
CHICAGO ARCHIVES.

IN THE LAST 20 YEARS, global health experts have recognized the importance and encouraged the adoption of sin taxes in the fight against non-communicable diseases (NCDs) in the Global South. At the level of discourse, this is illustrated by the vast global health literature on NCDs published from the late 1990s onwards: reports and action plans issued by international organizations like the World Health Organization (WHO) and the World Bank, editorials and scientific papers in medical journals like *The Lancet*, and policy documents and pamphlets prepared by aid agencies, health charities, and private philanthropies. Most of these documents start by reminding readers that NCDs—chronic diseases such as cancer and diabetes associated with behavioral risk factors like smoking, drinking, and unhealthy diets—are now responsible for most of the burden of death and disability across the Global South. They then identify excise taxes levied on tobacco, alcohol, and sugar as the most effective strategy to address this burden of death and disability. This literature explains how—given that price is correlated with demand for tobacco, alcohol, and sugar—increasing taxes on these products will markedly reduce rates of smoking, drinking, and unhealthy eating and thereby the incidence of chronic diseases associated with these behaviors. It also stresses how sin taxes not only improve the health of nations, but also strengthen their finances. Indeed, as many of the experts cited in this literature make clear, increased taxation rates largely compensate for the decrease in tobacco, alcohol, and sugar consumption, thus allowing national governments to amass larger tax revenues that can

be earmarked to finance national health systems and achieve universal health coverage. Last but not least, this literature also extols the fact that, as indirect taxes, sin taxes are relatively easy to set up and administer for governments. At the level of practice, the growing importance of sin taxes within global health can be illustrated by the mounting number of countries in the Global South—from Chile, Mexico, and South Africa to Thailand, India, and the Philippines—that have introduced taxation schemes for tobacco, alcohol, and/or sugar to combat the NCD epidemic. Many of these national schemas have been supported by international efforts such as the Bloomberg Initiative, a US$1 billion project to reduce tobacco use in developing countries led by the Bloomberg and Gates foundations, in which sin taxes play a central role.

In many ways, sin taxes are typical of the micro-technologies that have proliferated in the fields of development and humanitarian aid in the past two decades, what Stephen Collier, Peter Redfield, and their colleagues have called "little development devices" and "humanitarian goods" (Collier et al., 2017; Cross, 2013; Redfield, 2012). Indeed, like many of these micro-devices, sin taxes are meant to improve people's quality of life, are eminently portable, and, as I discuss below, operate at the micro level, targeting individuals' aspirations, preferences, and calculations rather than any larger macroeconomic aggregate. In this essay I shed some light on the complex genealogies of these micro-technologies by unpacking some of the political theories, scientific concepts, and ethical norms that make up sin taxes. I suggest

SIN

David Reubi explores how Chicago Economics remade Global Public Health.

that sin taxes are built around a particular subject—the rational actor seeking to maximize their welfare in line with their own preferences—whose origins can be traced back to the Chicago School's microeconomic tradition and its concern with rational choice theory. In doing so, I draw on Madeleine Akrich's (1992) concept of "de-scription" and her claim that one can find inscribed in a technical device many of the assumptions, aspirations, and values of those who designed it. In my de-scription of sin taxes I examine the work of a small network of economists led by University of Chicago professor Gary Becker and two of his collaborators, Mike Grossman and Frank Chaloupka, that was instrumental in transforming sin taxes into an accepted global health strategy. In particular, I focus on this network's research on tobacco taxation, which was the first type of sin tax to gain acceptance in the global health field and later served as a model for excises on alcohol and sugar. I begin by showing how this research grew out of Chicago's microeconomic tradition and Becker's work in particular before examining how it radically transformed international tobacco control and the model of the smoker that underpins it. I conclude by reflecting on what this story can teach us about the wider history of the recent proliferation of micro-technologies in the fields of development and humanitarian aid.

The Chicago microeconomic tradition was articulated by George Stigler, Gary Becker, and other members of the Chicago School from the 1950s onwards. As historian Steven Medema (2011:153) has carefully documented, for the earlier generations of Chicago economists, from Frank Knight to Milton Friedman, economics was the study of the "social organization of economic activity" and, in particular, "markets as coordinating devices." This changed after the 1960s following the arrivals of Stigler and especially Becker at the University of Chicago. For this new generation, economics was redefined as the study of "human behavior" and, specifically, "rational individual choices" under "conditions of scarcity" (Medema 2011:161–162). By redefining their object of study in this way, the new generation of economists at Chicago profoundly altered their discipline (Foucault 2008). First, they made it possible to analyze how individual decisions had implications at the macro level, thus extending economic analysis within its own domain. Second, they encouraged economists to espouse an expansionist agenda and apply their methods to traditionally non-economic domains. As Medema (2011:172) has also showed, the reason for the shift of focus from social organization and markets to individual behavior and choice lies in the marked influence that rational choice theory had on many of the new generation of Chicago economists. Indeed, this "new science of choice," articulated during the Cold War around the notion of the "rational actor," was a "catalyst for change" in the American social sciences, where it introduced a fresh focus on and new techniques to analyze the role of individuals and their decisions in the making of complex social phenomena (Amadae 2003:5–8).

Gary Becker's work has been central to Chicago's microeconomic tradition (Medema

2011). Becker established the idea that economics was about the study of human behavior and choice. A disciplinary imperialist, he also believed that economics should not be limited to behaviors usually studied by economists but expanded to behaviors traditionally analyzed by other social scientists such as sociologists and anthropologists. As Becker explained, economics was about "problems of choice," whether that was "the choice of a car, a marriage mate [or] a religion" (cited in Medema 2001:161). These beliefs strongly influenced the sort of questions (Why do individuals decide to invest in education? Why do they elect to marry and have children? Why do they choose to engage in criminal activity?) that he sought to address in his own research. The way in which Becker approached and analyzed human behavior was informed by rational choice theory. Specifically, he suggested that choices made by individuals should always be considered rational, even when they are criminal or antisocial. By *rational*, Becker (1992:38) meant that these choices are made by individuals who seek to "maximize welfare as they conceive it." He believed that when doing so, individuals take into account their own "values and preferences" and anticipate as best they can "the uncertain consequences of their actions" (Becker 1992:38). He also supposed that their choices are "constrained by income, time, imperfect memory, calculating capacities and other limited resources" and shaped by "the available opportunities in the economy and elsewhere" (Becker 1992:38). For Becker, the task of the economist was to develop and empirically test mathematical models that identified and organized these different variables in a way that explained and predicted the type of behavior being analyzed.

Not until the 1980s–1990s did economists systematically apply the tools and concepts of Chicago microeconomics to the study of smoking (Reubi 2013, 2016). Two interrelated bodies of work were critical in that respect. The first encompassed the studies on the demand for tobacco products carried out by Mike Grossman together with his former student Frank Chaloupka and others (e.g., Chaloupka and Grossman 1996; Lewit et al. 1981). Grossman was key in popularizing the use of Chicago microeconomics to analyze health-related behaviors, both in his own research and as director of the National Bureau of Economic Research's (NBER) Health Economics Program. For his PhD carried out under Becker's supervision, Grossman constructed a model of the "demand for good health" where health was a form of "human capital" that everyone possessed
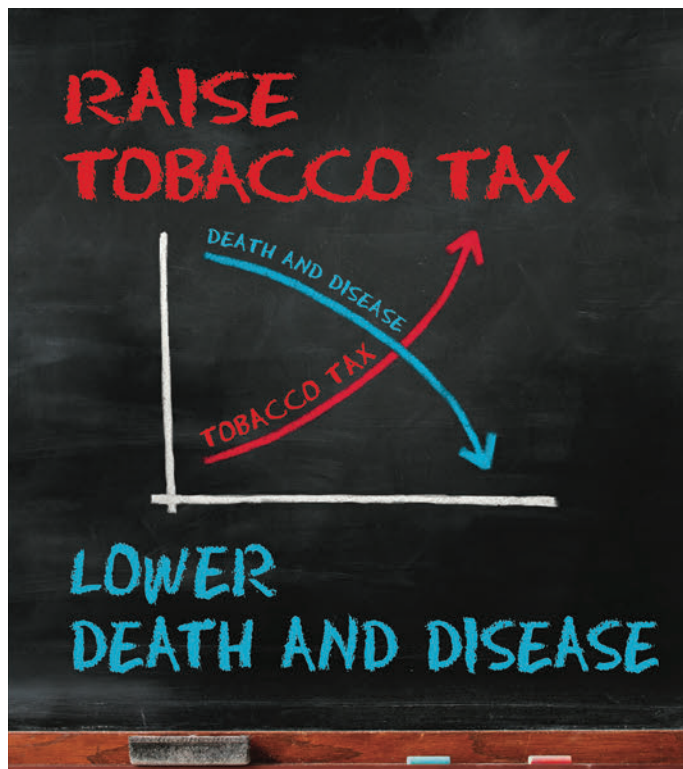
Higher tobacco taxes = fewer smokers, less death and healthier communities.

WORLD NO TOBACCO DAY, 31 MAY
www.who.int/world-no-tobacco-day

Pan American Health Organization

World Health Organization
Americas

FIG.1.
WHO poster for the 2014 World No Tobacco Day advocating for taxes on tobacco products as a strategy to lower the associated burden of death and disease.

and could choose to invest in and increase (Grossman 1972:xiv–vx). Given his interest in health at a time when smoking had become a major public health issue in North America and Europe, it is unsurprising that Grossman subsequently chose to work on the demand for cigarettes together with Chaloupka and other colleagues. This research first established that price was a key factor for the demand for cigarettes. The research also showed that price was a particularly powerful motivator for young adults and individuals of low socioeconomic status, who have less income and are more resistant to public information campaigns on the dangers of smoking. The second body of work encompassed the studies on addiction conducted by Becker in collaboration with Grossman, Chaloupka, and a few others (e.g., Becker and Murphy 1988; Chaloupka 1990). Building on insights from rational choice theory, Becker and his collaborators claimed that contrary to popular belief, "addictions are rational in the

sense of involving forward-looking maximization with stable preferences" (Becker and Murphy 1988:675). Using cigarettes and alcohol as their case study, they also built and tested a behavioral model that predicted the demand for addictive substances was greater among individuals who had "low incomes," were "more

present-oriented" and/or had experienced "unhappy" and "stressful events" (Becker and Murphy, 1988:694; Chaloupka 1990:737).

Up to this point, two very different intellectual traditions dominated the field of international tobacco control. The first, which stemmed from the field of health education, was built on the notion of knowledge or information (Berridge 2007, chapter 2; Reubi and Berridge 2016). Public health experts working within this tradition assumed that people smoked because they did not know that tobacco was harmful to their health. Following that assumption, experts believed that their main task was to ensure people were informed about the dangers of smoking. This meant educating people about these dangers through warning labels on cigarette packages, school education programs, and, most important, public information campaigns, which were deemed to be the most powerful anti-smoking measure at the time. This also meant shielding people from the tobacco industry's marketing and public relations efforts through advertising bans and advocacy tactics to monitor and counter the industry. The second tradition, which grew out of developments in psychology and psychopharmacology, was centered on the notion of addiction (Berridge 2007, chapter 9; Brandt 2004).

For public health experts and psychologists who came from this tradition, the reason people smoked, or continued to smoke, was their addiction to nicotine, the psychoactive substance in tobacco. Specifically, they contended that nicotine could, by acting on the brain via complex biomolecular pathways, control the behavior of smokers and compel them to continue smoking. For these experts, the main task was to treat this addiction, which they viewed as a pathology, by using smoking cessation techniques such as behavioral and nicotine replacement therapies.

The work on smoking carried out by Becker and his colleagues posed a direct challenge to these two intellectual traditions, leading to a rupture in and a partial reconfiguration of the field of international tobacco control in the late 1990s. To start, the work of Becker and his colleagues radically altered the view public health experts held on taxation (Reubi 2013). Until then, these experts largely ignored sin taxes as an anti-smoking measure for many reasons, ranging from ignorance about how taxation worked to discomfort about sin taxes' regressive nature. The network of economists led by Becker helped change this perception, progressively bringing public health experts to see taxation (rather than public information campaigns) as the most potent strategy in the fight against tobacco. Grossman's work in particular, which showed that price (rather than knowledge) was key in curbing tobacco use in groups where prevalence rates had remained stubbornly high (like the young and the poor), was critical in that respect. Furthermore, the work of Becker and his colleagues also helped establish a new model of the smoker in public health thought. Inscribed in the taxation schemes now multiplying across the tobacco control field, this model was centered on the idea of individual choice rather than the notions of knowledge and addiction associated with health education and psychology, respectively. In this new model, people smoked because they made a rational choice to do so in the sense of a welfare-maximizing calculus based on their preferences and existing circumstances. Although knowledge and addiction retained a place within this model, they were only two factors among many others such as price, education, and pleasure that could influence an individual's decision to smoke. Moreover, it was up to that individual to determine the importance of these two factors when they weighed their options. As Chaloupka and other leading public health experts and economists argued in an influential World Bank (1999:3) report on tobacco control:

Consumers are usually the best judges of how to spend their money…. [They make] rational and informed choices after weighing the costs and benefits of [their actions]…. Smokers clearly perceive benefits from smoking, such as pleasure and the avoidance of withdrawal, and weigh these against the private costs of their choice. Defined this way, the perceived benefits outweigh the perceived costs, otherwise smokers would not pay to smoke.

To recapitulate, I showed here how a global health device like sin taxes grew out of Chicago's microeconomic tradition and, in particular, Becker's project to redefine economics as a function of individual choice and expand it to non-economic domains. Moreover, I outlined how sin taxes were later decoupled from Becker's project and redeployed as a key strategy in public health efforts to fight the smoking epidemic in the Global South. This redeployment, I also showed, was accompanied by the introduction of a new model of the smoker—the rational, welfare-maximizing individual—within the international tobacco control field. To conclude, I want to reflect on how this story relates to wider historical accounts about the proliferation of micro-technologies within international development and humanitarian aid. In their writings, Collier, Redfield, and others caution against the familiar and well-rehearsed explanation that this proliferation is the result of a shift from welfare states and the social to markets and the individual (e.g., Collier 2011; Cross, 2013; Redfield 2012). Instead, they suggest that the multiplication of these micro-devices is associated with a rupture in development thought from a macroeconomic concern with large, national physical infrastructure projects to a microeconomic focus on the investments in human capital (Collier et al. 2017; see also Reubi 2016). The story of sin taxes outlined here strongly resonates with this broad historical tableau sketched by Collier and others. To begin with, sin taxes emerge from the reconfiguration of Chicago economics from a macroeconomic discipline concerned with markets as coordinating devices to a microeconomic tradition focused on rational individual behavior. It is worth emphasizing that, in the context of this reconfiguration, markets and individual choices stand in contrast to each other. Indeed, this might come as a surprise to some readers for whom markets and individual choice are necessarily—almost naturally—associated. Furthermore, it is critical to realize

Factsheet 1.
Tobacco taxation
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that the shift from mass public information campaigns to sin taxes that marked the field of international tobacco control in the late 1990s was not a shift from the social to the individual, but rather a change in the concept of the individual. It was a move away from an individual for whom knowledge always and automatically triggered certain actions to an individual who could decide not to act on knowledge and prioritize other elements such as money and pleasure instead. Last, the strong emphasis placed on individual choice in both Becker's attempts to reform economic thought and global health efforts to curb smoking should not be interpreted as the death of the social. Indeed, in echo of Collier's (2011) work on the post-Soviet social, the notion of the social or society has remained important for both projects, albeit in different forms. Thus, for Becker (1997:150), sin taxes are "social taxes" that can protect American "society" from the "social harms" associated with rational addictive behaviors, whereas for global health experts, sin taxes are public health "interventions" that can shield developing "societies" from the health effects and "socio-economic toll" of "21st-century lifestyles" (WHO 2010:vii, 37). ■

FIG 3. Cover of the International Union against Tuberculosis and Lung Disease's Factsheet on Tobacco Taxation, with the caption "Young people are most likely to quit when prices rise."

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BIBLIOGRAPHY

Akrich, Madeleine. 1992. "The De-Scription of Technical Objects." In *Shaping Technology/Building Society,* edited by W. E. Bijker and J. Law, pp. 205–224. Cambridge, MA: MIT Press.

Amadae, S. M. 2003. *Rationalizing Capitalist Democracy.* Chicago, IL: University of Chicago Press.

Becker, Gary. 1992. "The Economic Way of Looking at Life." In *Nobel Lectures, Economics 1991–1995*, edited by T. Persson, pp. 38–58. Singapore: World Scientific.

———. 1997. *The Economics of Life.* New York: McGraw-Hill.

Becker, Gary, and Kevin Murphy. 1988. "A Theory of Rational Addiction." *Journal of Political Economy* 96(4):675–700.

Berridge, Virginia. 2007. *Marketing Health.* Oxford, UK: Oxford University Press.

Brandt, Allan. 2004. "From Nicotine to Nicotrol." In *Altering American Consciousness,* edited by S. W. Tracy and C. J. Acker, pp. 383–402. Boston, MA: University of Massachusetts Press.

Chaloupka, Frank. 1990. "Rational Addictive Behavior and Cigarette Smoking." *Journal of Political Economy* 99(4):722–742.

Chaloupka, Frank, and Mike Grossman. 1996. *Price, Tobacco Control Policies and Youth Smoking.* New York: NBER.

Collier, Stephen. 2011. *Post-Soviet Social.* Princeton, NJ: Princeton University Press.

Collier, Stephen, Peter Redfield, Jamie Cross, and Alice Street. 2017. "Little Development Devices/Humanitarian Goods." *Limn* 9.

Cross, Jamie. 2013. "The 100th Object." *Journal of Material Culture* 18(4):367–387.

Foucault, Michel. 2008. *The Birth of Biopolitics.* Basingstoke, UK: Palgrave Macmillan.

Grossman, Mike. 1972. *The Demand for Health.* New York: NBER.

Lewit, Eugene, Douglas Coate, and Mike Grossman. 1981. "The Effects of Government Regulation on Teenage Smoking." *Journal of Law and Economics* 24:545–569.

Medema, Steven. 2011. "Chicago Price Theory and Chicago Law and Economics." In *Building Chicago Economics,* edited by R. Van Horn, P. Mirowski, and T. Stapleford, pp. 151–178. Cambridge, UK: Cambridge University Press.

Redfield, Peter. 2012. "Bioexpectations." *Public Culture* 24(1):157–184.

Reubi, David. 2013. "Health Economists, Tobacco Control and International Development." *BioSocieties* 8:205–228.

———. 2016. "Of Neoliberalism and Global Health." *Critical Public Health* 26(5):481–486.

Reubi, David, and Virginia Berridge. 2016. "The Internationalisation of Tobacco Control, 1950–2010." *Medical History* 60(4):453–472.

World Health Organization (WHO). 2010. *Global Status Report on Noncommunicable Diseases.* Geneva, Switzerland: WHO.

World Bank. 1999. *Curbing the Epidemic.* Washington, DC: World Bank.

customer care

Robert Foster explores how mobile phones in Papua New Guinea offer new ways for both companies and consumers to give and receive care.

Digicel billboard in Goroka, Eastern Highlands Province, Papua New Guinea, 2015.
PHOTO BY D. DOIKI

THE MOBILE PHONE REVOLUTION in Papua New Guinea (PNG) began in July 2007 when Irish billionaire Denis O'Brien's company Digicel, in response to the government's liberalization of the telecommunications sector, began rolling out its wireless network. Digicel was warmly welcomed by a country whose citizens felt neglected—if not downright mistreated—by the erstwhile state-owned monopoly Telikom due to the prohibitively expensive and geographically limited wireless services of its subsidiary Bemobile. Digicel did not disavow nationalism, to which Telikom reactively appealed, and also apparently cared about PNG, sponsoring sports teams and cultural festivals.

Most important, Digicel delivered wireless service to areas where it was never before available (Fig. 1), thus making good on its promise to bring the nation together (Fig. 2).

Individual customer benefits mattered too. Digicel quickly put basic handsets such as the Nokia 1020 within affordable reach of tens of thousands of people, many living in remote rural areas. By virtue of small, prepaid purchases of airtime, villagers could for the first time experience long-distance communication, especially with kin living and working in urban centers. And when a customer had no credit on her phone, she could use the free "call me" short-message service (SMS) to request that a loved one get in touch (Fig. 3). Digicel clearly understood the value of mobile phones as affective technologies, objects that "mediate the expression, display, experience and communication of feelings and emotions" (Lasen 2004:1).

IN THE BEGINNING, people did not have many numbers to call or much credit with which to call. So they called Customer Care. Dial 123. 24/7. Free. They still call. But now there is a charge for calling during off-peak hours. The charge is meant to discourage prank calls, especially late at night.

People also called numbers randomly in search of phone friends who might become romantically involved and eventually meet face to face. Persistent calls from unknown numbers became a common topic of public conversation and a compelling justification for legislating mandatory registration of subscriber identity modules (SIM cards), which finally happened in 2016.

Mobile phones entrained new possibilities not only for sustaining long-distance kin

she used until the inconvenience of not having a matching charger for the phone compelled her to buy a new entry-level Alcatel smartphone for 149 kina (approximately US$50; Fig. 4).

For Karen, the phone was helpful in overcoming her nervousness about approaching her lecturers and tutors in person. She would instead call them and pay attention to how they conversed and asked her questions: "How may I help you?" Karen learned and repeated her lecturer's conversational strategies in her face-to-face interactions with others, developing a sense of confidence and clarity in her public speaking. "I learned how to approach people…. I felt like my life changed."

The phone allowed Karen to overcome her timidity (and she has witnessed similar transformations in other female university students). For example, Karen now has no hesitation about calling Digicel's Customer Care when she has questions about the accuracy with which her prepaid balance of airtime is being managed. Dial 123, send: "How may I help you?" Digicel

relations but also for experimenting with self-development. The capacity to engage in novel forms of intimacy with strangers and in private forms of communications with intimates was welcomed by some, decried by others, and regarded with ambivalence by most people. New ways to express care and concern—such as sending and receiving credit requests for airtime—were offered by a company that promoted itself as a caregiver to its customers and to the nation as a whole.

At the same time, mobile phones, understood as social and material assemblages that include more than the discrete handset, were taken up in ways that exposed the premises of a robust moral economy: what companies, consumers and state agents owed to each other posed a perpetually open question. The capacity of the PNG state to regulate Digicel, which owns and controls the network it built, is weak; the business challenge faced by Digicel to overcome the absence of a reliable electric power grid and the chronic insecurity of corporate assets such as cell towers, which are regularly vandalized, is enormous; and the ability of consumers to use the network in the face of limited financial means and increasing demand for smartphones and data is always under threat.

In short, the moral economy of customer care in PNG is precarious for everyone. Here I offer five brief ethnographic examples.

KAREN ACQUIRED HER FIRST mobile phone when she came to university in the capital city of Port Moresby in 2011. She already had friends who owned mobile phones despite an official ban on the devices at her high school. But at university, every student seemed to have not just a phone, but a smartphone that enabled use of the internet for their studies. Having a phone appeared to be a standard expectation, and students who did not have them felt an acute sense of being left out. Karen's uncle gave her an old Samsung model that he brought from Australia, which

Since its launch in 2007, Digicel has achieved market share of about 95% in PNG. The company claims that its "bigger and better network" of more than 1,100 cell towers now covers almost 90% of the population. The so-called penetration rate of mobile phone subscriptions is 49%, representing some 4 million subscriptions (compared with 1.6% in 2006, which is also the current penetration rate of fixed-line telephony). A Digicel official reported in 2016 that approximately 800,000 of these subscriptions are for smartphones. These smartphones are the primary means for most people to access the internet, hence the remarkable growth in the last several years in the number of internet users in PNG from less than 2% in 2010 to more than 11% in 2016.

will find the right person to attend to her concern. The next time Karen makes a call, she will be charged at a lower rate. She is not sure how it works exactly. But they respond. "They respond...because I am their customer." As a customer, Karen received the sort of recognition that many Papua New Guineans seek in vain from a state that has failed since independence in 1975 to bring development to its citizens in the form of tangible goods and services.

NOT ALL DIGICEL CUSTOMERS agree with Karen. The evidence is found on the Facebook page of the Digicel Complaints Group, a public forum for more than 43,000 mobile phone users. Group members who purchase airtime from Digicel, the dominant mobile network operator, use the forum to register dissatisfaction with the company's services. They express particular concern about the conversion of prepaid airtime into data and the dubious ways in which Digicel adds and subtracts data from an individual's balance. Complaints often concern the failure of credits to appear on a person's phone after a purchase has been made or the disappearance of data from a person's balance even when the phone is not in use.

My friend Cletus's complaint to the group is fairly typical:

> At exactly 11am today, I entered two K5 flex numbers: 01 7249 490 5910 & 16 2662 659 3637. At exactly 11:14am, Digicel sent me two messages: 1. Advised that I have used up my data and 2. Asked whether I need airtime of K13 advance. I immediately checked my balance only to see K5.03. I texted Digicel and 5 minutes [later] I was reimbursed K3 and not the whole K4.77. What a daylight robbery!

People sometimes post screenshots of the balances on their phones as evidence of stolen data. Accusations of robbery and theft, of being "ripped" (off), are commonplace. Such complaints recall historian E. P. Thompson's (1971) well-known account of the protests that erupted as a moral economy of food provision gave way to practices and principles associated with "free trade" in 18th-century England. These protests, which often led to direct action, invoked notions of fair and transparent dealing in the face of concerns that the poor suffered at the hands of those with "command of a prime necessity of life" (Thompson 1971:93). Much like the folks about whom Thompson wrote, Digicel Complaints Group members express intense feelings over "weights and measures"

FIG. 4. Entry-level smart-phone on display at Digicel retail outlet, 2014.
PHOTO BY R. FOSTER.

and beseech the authorities to regulate business transactions. In other words, offended consumers look for help from the same neglectful state that let them down before Digicel arrived.

THE CAPACITY of poor people to own and operate a phone in the developing world hinges on technologies of prepay, which allow users to pay as they go by buying small amounts of airtime when necessary or when funds become irregularly available. Managing one's airtime requires tempering the practice of self-discipline with responsiveness to the obligations of caring for others.

Winnie is a heavy user who can spend up to 100 kina (US$33) a week in airtime credits. She is a young single woman living far from home

and regards frequent communication with her family and friends as nothing less than essential. Winnie has a steady income and is generous when her kin send credit requests for airtime, which she can transfer directly to their phones for a small fee. She says that she is capable of spending all her savings on airtime, and she has on occasion come close to doing so by "topping up" her phone through a mobile banking account, a relatively new service that effectively enables users to purchase airtime anytime, anywhere. (A fair comparison is with gambling machines that provide access to a player's bank account without requiring the player to leave his or her seat in front of the machine.) To discipline herself—and she used the English word *discipline*—Winnie has opened an account with another bank into which she makes weekly deposits. This bank, Winnie explained, does not offer the mobile top-up service. She has thus safeguarded her money from herself (see Foster 2018).

Winnie is explicit about the calculations that she makes in managing her mobile phone. She says that she does not feel able to start the day unless she is equipped to communicate. So, in the morning she will top up her phone for 5 kina (US$1.66). This top-up gives her 100 free promotional minutes for use between 11pm that night and 7am the following morning. She then purchases a one-day data pass: 60 MB for 3 kina. This data is enough to allow her to go online and communicate with friends and family via the applications WhatsApp and Viber. Winnie discovered that she could send voice messages over the internet for much less money than making voice calls. Finally, Winnie purchases a discounted bundle of 60 text messages for 1.20 kina. She will use most if not all of these text messages before they expire at midnight. That leaves 80 toea as a balance in case Winnie needs to make a quick phone call during the day (100 toea = 1 kina). (On-net calls from one Digicel phone to another are billed at 79 toea per minute, with per-second billing, during the peak hours of 7am to 9pm.) Once she has made these preparations, Winnie feels ready to go out into the world and meet the demands of the day.

WINNIE'S DAILY ROUTINE might understandably lead one to conclude that a peculiar kind of calculative rationality has been baked into the phone itself, such that Winnie's habit of giving gifts to her relatives is subsumed within the sort of measuring and monitoring associated with markets and commodity exchange. This same tension between alternative logics of gift and commodity shapes the larger social and material

assemblage of which the phone itself is part. It is a tension that threatens the future of customer care.

Matthew, a single man in his early thirties, repairs mobile phones and sells airtime at a street stand in the highlands town of Goroka (Fig. 5). He occupies a particular spot on a particular corner with other vendors who sell cigarettes, betel nuts, hard-boiled eggs, soft drinks, and the scratch (or "flex") cards that people buy to top up their mobile phone airtime balances (Fig. 6). Matthew was one of the first to teach himself how to repair phones; he and his friend and workmate Gabriel were also among the first to start selling airtime in 2009 as Digicel expanded its network of cell towers across the country.

Matthew regards his work as a service to the community; indeed, to the nation. His business yields to the demands of a moral economy that Thompson would easily recognize. Villagers who come to town with no money can offer their homegrown bananas or sweet potatoes in exchange for repair services. Town workers, however, will be sized up and charged according to Matthew's estimate of their ability to pay. The vendors, moreover, care for each other: they all offer their goods at the same price and eschew overt competition. One vendor's business crashed when he overspent his revenue and was unable to purchase a new supply of scratch cards. A fellow vendor hired him until he was able, a year later, to save enough money to re-establish his own business.

Matthew insists that he and his fellow vendors are part of Digicel: without them the network would not work. His recognition of people as infrastructure is entirely plausible; Digicel still relies on vendors in places like Goroka to distribute airtime credit into the hinterlands where people prefer to buy scratch cards in town for use (or resale) later in the village. In cities like Port Moresby, however, the advent of smartphones has enabled more and more people to top up directly online, buying airtime like Winnie through linked banking accounts. Moreover, new forms of "self-care"—quite different from the kind of care that Matthew affords his customer—are being promoted. In January 2017, Digicel launched the My Digicel App for smartphone users, promising customers an efficient tool for "managing their Digicel life" (*The National* 2017). Several months later, the company introduced a menu that would allow customers, including users of basic handsets, to assist themselves with queries relating to data and top up, among other things. Dial *123#. 24/7. Free. A list of frequently asked questions

FIG. 6. Street vendor selling scratch or "flex" cards, Goroka, 2015. PHOTO: W. MAGEA

FIG. 7. Digicel ad for solar panel at Jackson's Airport, Port Moresby, 2016. PHOTO: R. FOSTER

appears on the phone's screen.

The future of the prepaid scratch card is dubious, and the economic niche of street vendors is shrinking. There is a policy argument to be made that preservation of the scratch card vendors' livelihood would support the so-called informal economy on which so many Papua New Guineans depend. For Matthew, however, it is an ethical as well as economic question: Does Digicel really care about him and his fellow vendors, who were present at the beginning when the company was first establishing itself in the country? His concerns echo those of the

Digicel Complaints Group, and pose the unsettling question of whether Digicel still cares for the people of PNG 10 years after the company brought them a revolution in communications.

DIGICEL OF COURSE expresses care and concern in ways that are familiar to corporate observers, if not immediately relevant to Matthew. The company has set up a branch of the Digicel Foundation in PNG as a way of giving back to the community by funding health and education projects—providing bits of infrastructure that the state has not—like a reliable nationwide telecommunications system. The company has even addressed one of the main problems for individuals in operating a mobile phone, namely, keeping the battery charged. Outside of urban centers, which experience frequent power outages, access to electricity is severely restricted. Digicel has responded by marketing small solar panels for 95 kina (US$31; Fig. 7).

The Digicel Foundation attracts the standard critiques of corporate social responsibility: it's window dressing and public relations and so on. Whether the Digicel Foundation is successful in promoting goodwill and positive sentiments among the people of PNG is unclear. The uptake of mobile phones in the country, however, continually surprises with respect to the capacity of these devices as affective technologies. My final ethnographic example underscores the high stakes involved in the emergence of a desirable new form of affective technology over which one's control is exceedingly tenuous.

Lucy is in her early fifties, a rural woman with little education who, after being diagnosed as HIV positive, was struggling to live on her own after her older brother had refused to take her in.[1] A previous husband offered Lucy some money and a used mobile phone. Desperate, hungry, and contemplating suicide, Lucy began calling the contacts saved in the phone until one woman, instead of yelling and hanging up, agreed to speak with her. This woman, Angela, responded with compassion and began sending Lucy small gifts of food, money, and secondhand clothes. Lucy and Angela never met, but continued to talk by phone, thereby restoring Lucy's feelings of hope and alleviating the anxieties that Lucy thought would reduce the effectiveness of her anti-retroviral medications. A friend found by chance on a random call enabled Lucy's old mobile phone to function therapeutically as an affective technology, a medium for giving and receiving care.

Lucy's story, like Matthew's, exposes not only the possibilities but also the vulnerabilities inherent in the shifting moral economy of mobile phones. But Lucy's story does not end well. Her phone, the source of Lucy's emotional sustenance, was eventually stolen: "All those phone friends, in Port Moresby, Mt. Hagen, and other places, they would send me credit, and we talked all the time, every night, and now I don't have a phone, and I've lost all those numbers. It's terrible. I can't stop crying about it. I had the same phone for four years, and had so many numbers, so many friends. And now it's all gone." ∎

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BIBLIOGRAPHY
Foster, Robert J. 2018. "Top-Up: The Moral Economy of Prepaid Mobile Phone Subscriptions." In *The Moral Economy of Mobile Phones: Pacific Islands Perspectives* edited by R. Foster and H. Horst. Canberra, Australia: ANU Press, pp. 107-125.

Lasen, Amparo. 2004. "Affective Technologies—Emotions and Mobile Phones." *Vodafone Receiver Magazine* 11. http://www.academia.edu/472410/Affective_Technologies._Emotions_and_Mobile_Phones

The National. 2017. "Digicel PNG Launches My Digicel Application." *The National,* January 20. http://www.thenational.com.pg/digicel-png-launches-digicel-application/

Thompson, E. P. 1971. "The Moral Economy of the English Crowd in the Eighteenth Century." *Past and Present* 50:71-136.

Wardlow, Holly. 2018. "HIV, Phone Friends, and Affective Technology in Papua New Guinea." In *The Moral Economy of Mobile Phones: Pacific Islands Perspectives,* edited by R. Foster and H. Horst. Canberra, Australia: ANU Press, pp. 39-52.

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1   Lucy's story is told more fully in Wardlow (2018).

Christopher Kelty opens up a toolkit from the 1990s to explore the prehistory of apps, platforms, and algorithms.

the participatory development toolkit

The Participatory Development Toolkit, created by Deepa Narayan, Lyra Srinivasan and others, funded by the World Bank and the United Nations Develop- ment Program, produced in India by Whisper Design of New Delhi, coordinated by Sunita Chakravarty of the Regional Water and Sanitation Group in New Delhi in 1994. This copy owned by the Getty Research Library, Los Angeles, CA.

tHE PARTICIPATORY DEVELOPMENT Toolkit is a "small briefcase (26 x 33 x 10 cm) containing 221 activity cards, 65 pictures, 11 charts, 1 guidebook"; it is "covered in brown pattered cloth, with leather handle and leather snap closure." It is decorated with drawings of women, abstract patterns, huts, trees, animals: drawings, the kit's guide explains, "by the Warli tribe, who live in the Sahadri mountains in Maharashtra state north of Bombay" and who are "known for their mythic vision of Mother Earth, their traditional agricultural methods, and their lack of caste differentiation" (Narayan-Parker and Srinivasan 1994).

The Participatory Development Toolkit was created in 1994 primarily by Lyra Srinivasan and Deepa Narayan, two development professionals who at the time worked for the United Nations Development Program (UNDP) and the World Bank. Unsnapped and opened, it reveals a set of 25 folders and a booklet: "Each individual envelope is coded with a number and a title on its flap." The lid folds back to allow the kit to form a stand, and "every fifth envelope has a color-coded tab. To gain access to the materials in each set of envelopes, pull the tab and the envelopes will extend toward you" (Narayan-Parker and Srinivasan 1994). The Participatory Development Toolkit arrived at the zenith of the rage for "participatory" development. That enthusiasm lasted from the early 1970s, when the United Nations created a "Popular Participation Program" (Pearse and Stiefel 1979), to the 1980s spread of "participatory action research" (Reason 2008), to the prominence in the 1990s of the "participatory rural appraisal" (Chambers 1994) to the *2000/2001 World Bank Development Report*, which incorporated "Participatory Poverty Assessments" from around the world (Green 2014; World Bank 2001). Alongside the *World Bank Development Sourcebook* (World Bank 1996) and a range of other handbooks and sourcebooks and kits, the Participatory Development Toolkit stands out for being an actual kit: a briefcase containing folders that reveal a range of activities, cards, photographs, game pieces, puppets ("flexi-flans"), and, especially, sets of images.

One can sense in the Participatory Development Toolkit an enthusiasm for inclusiveness, respect, curiosity, and a close-to-the-community style of development; these games, cards, and images are designed to draw people into discussing problems and situations that immediately affect them, to elicit stories and images of the future they would prefer to have, and to debate the solutions to the problems they experience. There are countless versions of a sort of now-and-later game: pictures of unsanitary, impoverished, violent *nows*, followed by cleaner, wealthier, more humane *laters*.

It's not clear how often the kit (itself) was used. The games and images and techniques it contains show up in different settings across decades of attempts to install participatory development in various times and places. Many of the 25 different folders contain activities from Lyra Srinivasan's SARAR[1] methodology, one of dozens

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1   SARAR is a an acronym for "Self esteem, Associative strength, Resourcefulness, Action Planning, Responsibility." For more on SARAR, see Sawyer's documentary (2011).

of different pack-aged methods for engaging people in participation and collective uplift. Others are cribbed directly from the social psychol-ogy of Kurt Lewin, who himself in-spired a generation of "participatory" research, especially in management (Alden 2012; Lezaun and Calvillo 2014).

But the simple fact that the kit ex-ists at all is worth dwelling upon. Why was a "tool-kit" necessary for an activity called "participatory de-velopment" in the 1990s? Who were the tool users, and what might they have done with it? Is

Flexi-flans, Activity #8 sheets 1 and 2, (Narayan- Parker and Srinivasan 1994).

the toolkit a device for enticing participation, for improving it, or for something else? What imagination drove its form and function, and can we learn anything from it about today's attempts to build little development devices, or design humanitarian goods? Can we think of the Participatory Development Toolkit as a precursor to our contem-porary attempts to transform development through apps, platforms, algorithms or infrastructures?

THE PROBLEM OF A PARTICIPATORY DEVELOPMENT TOOLKIT

At the heart of this kit is a conundrum. The toolkit seeks to "scale up" and spread globally something conceived of as essentially "context specific." Participatory development, in most of its different guises, has always resisted the idea of a uniform, universal, top-down, one-size-fits-all development. Along with many other critiques of such dreams, participatory development proposes that proper develop-ment success should depend on attending to the very specific needs of particular people. Each community, village, neighborhood, council, or agricultural extension district is its own special place, with its own special needs that cannot be simply treated just like the next. Rather, development should involve the residents in diagnosing problems and planning solutions.

A toolkit is a device for decontextualizing: it is filled with tools that can be used in multiple different contexts, tools that are standardized and hardened into a semi-universal state. But the tools are not auto-matic; a toolkit implies the existence of a skilled tool user as well. A toolkit sits somewhere between an imagination of a context-specific,

autonomous, and self-guided development without any facilitation on the one hand; and on the other, the large-scale, univer-sal, automatic spread of one-size-fits-all solutions everywhere. The Participatory Development Toolkit itself reflects exqui-site awareness of this problem. The authors take pains to mount warnings at every turn: the kit does not stand alone; the images and games should not be used without adapting them; the kit should not be used to extract information (rather than incite participa-tion); the user of the kit should be prepared to give up control of the kit; the kit, indeed, is not essential (see, for example, Narayan-Parker and Srinivasan 1994:1–5; Srinivasan 1990:12–13).

In between universalism and hyper-specificity sits the kit: mediating by tak-ing what works at a local level, attempting to quasi-formalize it, and inserting it into a briefcase so that it can be carried to the next site to repeat its context-specific success.

"Scalability" of this sort is also at the heart of our contemporary enthusiasm for apps, platforms, and quasi-algorithmic
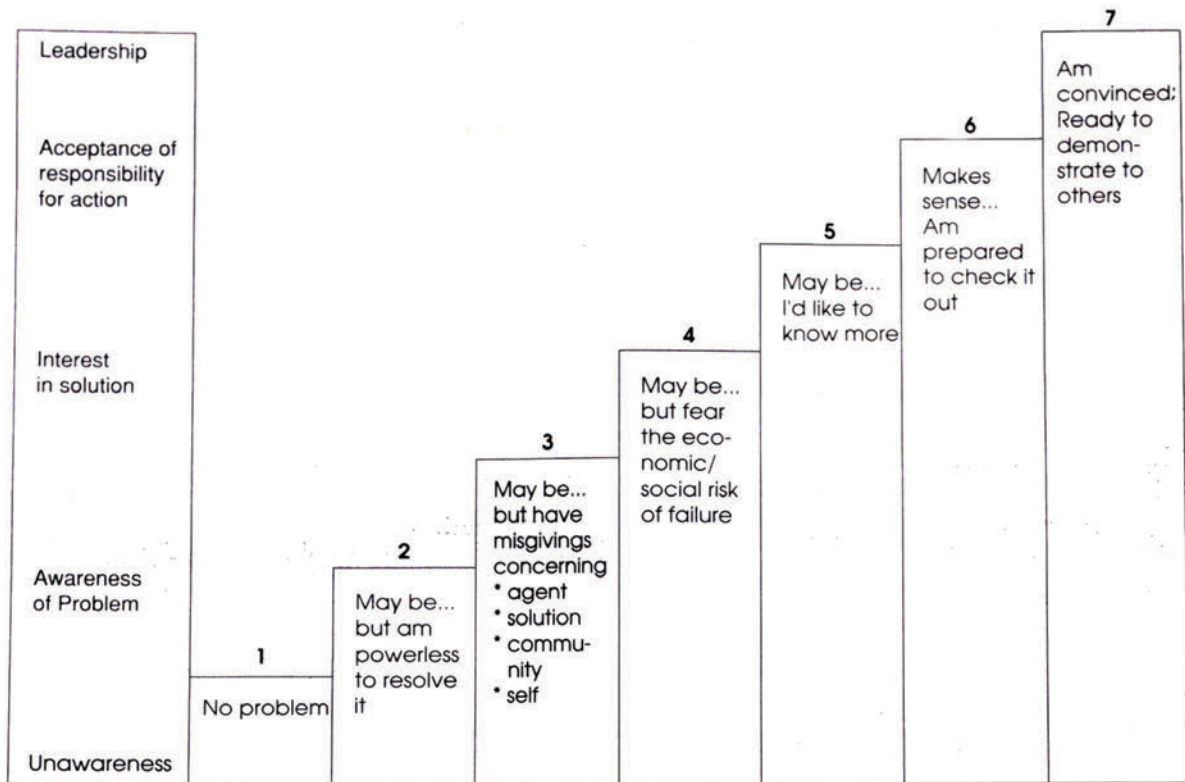
Activity #3, Chart 2, (Narayan-Parker and Srinivasan 1994).

solutions to the problems of developments. The large-scale "big development" projects of mid-century, where scale often meant simply "large," used "economies of scale" to attain a certain economization or efficiency as a project grew larger; conversely, the "small-is-beautiful" technology solutions of the 1970s counseled a return to the local, the situated, and the appropriate. But contemporary scalability sees in the small a mere instance of the large: a solution at the small scale (e.g., a LifeStraw for dirty water; Redfield 2016) can be "scaled up" and distributed globally. It is small and large at the same time. Some kinds of "tools" are scalable in this sense (software and algorithms preeminent among them), and others, perhaps, are not (dams and bush pumps).

The Participatory Development Toolkit tries to accomplish something similar: it takes a program for participation developed in response to specific cases, generalizes it, and spreads it to other sites and cases. It is "quasi-algorithmic" in the sense that it involves a set of steps in a sort of recipe, but it also relies on the existence of both a skilled tool user (the facilitator of participation, usually a development professional of some kind) and a defined group of participants (women, members of a village, a congress of delegates, extension workers, etc.). Such collectives are called into being just at the moment when the kit is in use. This process produces an experience called "participation."

To put this contemporary problem in perspective, it is important to emphasize that there have over the decades been plenty of examples of "experiments with participation" not only in development, but also in art, in science and technology policy, in urban planning, or in the workplace (Kelty 2017; Lezaun et al. 2016). It is worth turning to the history of participatory development to understand better what these past experiments sought to achieve.

THE PARTICIPATION THAT WAS

Participatory development has failed at least once already. This is perhaps not obvious to a generation of development workers or scholars discovering participation for the first time in the 2010s. In the 1970s both small, alternative groups (such as Budd Hall and the Participatory Development Network) and large organizations such as the United Nations Popular Participation Program embraced an earlier version of participatory development with enthusiasm. And as it succeeded from the 1970s to the 1990s, it came in for its own critique: by the year 2001, participatory development was being called "a new tyranny" (Cooke and Kothari 2001). The book bearing that subtitle suggested that many things had gone wrong with participation: that

it had been bureaucratically routinized; that recipients were gaming the system to become "professional participants"; that it rested on a myth of community or village structure that was inadequate in most places, or to the realities of globalization, and so on. Perhaps most important, it wasn't clear that participatory development alleviated poverty any better than non-participatory development had.

There was also a clear sense, captured best in Francis Cleaver's critique, that true participation had been betrayed by toolkits in general:

> *"Participation" in development activities has been translated into a managerial exercise based on "toolboxes" of procedures and techniques. It has been turned away from its radical roots: we now talk of problem solving through participation rather than problematization, critical engagement and class* (Cooke and Kothari 2001:53).

What were these radical roots, and how did they grow into a Participatory Development Toolkit? There are multiple interesting origin points for the Participatory Development Toolkit. The "radical" that Cleaver is no doubt thinking of is the work of Paolo Freire and more generally of "participatory action research" from the early 1970s onward (Freire 2014; Reason and Bradbury 2001). The idea that toolkit makers might try to roll up Paolo Freire and tuck him inside a kit is perhaps surprising, but actually quite obvious if one reads his work carefully. Freire's ideas of "*conscientização*" dictated not just a participatory engagement with the impoverished subject, but in particular the use of imagery, games, and specific forms of contextualization. The instructions for using these images in the Participatory Development Toolkit parallel Freire's own discussion of them in *Pedagogy of the Oppressed* (2014): they must be "non-directive" (i.e., not "sectarian") and they must rely entirely on the perceptions (and "perceptions of previous perceptions") of the "wretched of the earth" themselves. Many of the activities of the kit are directed toward instilling first an understanding of this "non-directive" form of analytical work, to be followed only later by substantive discussion of pumps, latrines, disease, and so on. Once inside the kit, however, Freire's radical, Marxist pedagogy runs the risk of appearing lightweight and inauthentic, transformed into an exercise in "project management" ripe for critique.

Stuffed inside the kit alongside Freire is Robert Chambers, the development scholar and practitioner most often associated with the rise of participatory development in the 1980s. Chambers started life as a colonial administrator in Kenya, and it was only late in the 1980s that he began to embrace participation as a technique (Cornwall and Scoones 2011). He came to it not as Freire did, as a liberation of the wretched of the earth, but primarily as a question of ascetic practice, which is to say it was less about the participation of the impoverished villager than a form of work on the self for the development professional. Chambers was primarily concerned with "seeing reality" clearly in the hopes of transforming poverty, and he insisted that most of what development professionals did obscured reality: they engaged in "rural development tourism," they suffered from "tarmac blindness" and "survey slavery" (Chambers 1983). They needed to be given the tools to see what was right in front of them, and to this end, Chambers advocated the flexible use of multiple different methods.

To address this problem, Chambers pioneered a kind of "method of any method," by which development workers could transform

Unserialized Posters; from "Fourteen pictures showing various human situations and interactions." Activity #7 in (Narayan-Parker and Srinivasan 1994, pp. 20-21)
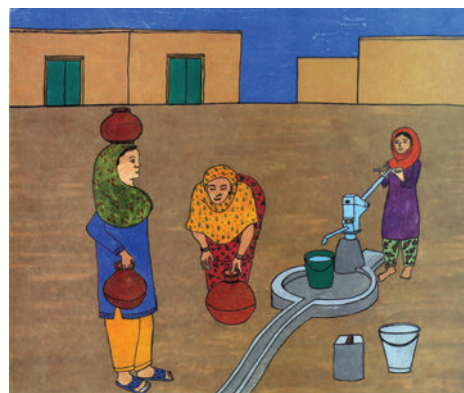
Pump Repair Issues. Activity #19 in (Narayan-Parker and Srinivasan 1994, pp. 44-45).

the simplest of techniques, like walking around and talking with people, into legitimate tools in a toolkit. Interviews, transect walks, pocket charts, ethnographic observation, and much more were lumped together and labeled "participatory rural appraisal." The approach is clear in the Participatory Development Toolkit: there are 25 folders with different games and activities,

each appropriate to a different challenge. There are also explicit directions, much like those that Chambers issued in everything he wrote, to "improvise" and adjust activities to the context and the site in question, to extend the kit and add to it, and, especially, to do so with the participation of those at the receiving end of development's interventions.
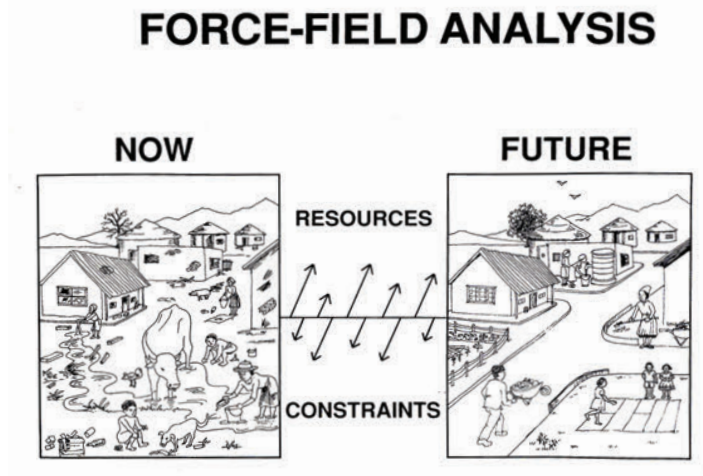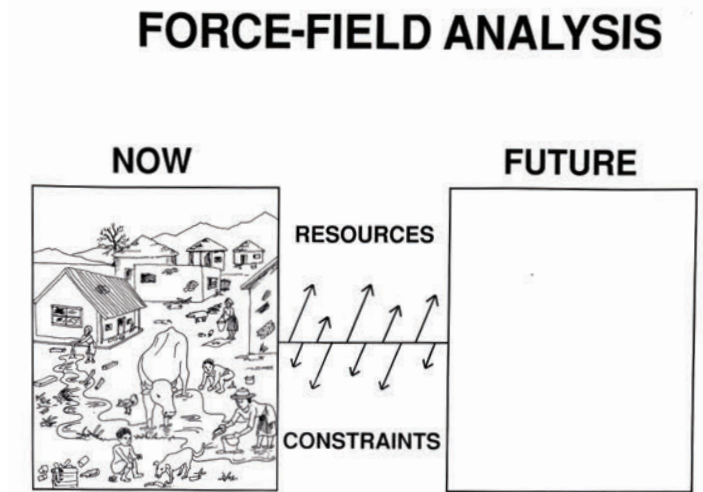
Chambers' approach implied that any such toolkit required a skilled tool user, and to become such a person, one had to work on oneself, develop new capacities, overcome blindness, see reality clearly, and so on. Only such transformed development workers would be able to effectively take this kit to the field to elicit the kind of participation promised by the likes of Freire (whom he recognized but did not claim as an inspiration). Despite the step-by-step nature of the toolkit (or any of the sourcebooks, scripts, or manuals promulgated as "participatory development"), the quasi-algorithm required a bit of human input: not just any human input, but that of self-reflective, awakened experts.

From the perspective of a later critic such as Cleaver, the toolkit is a proxy for the rigid, hierarchical, male engineer who sees a standard, technological solution to every problem. Participatory development—radical or not—is directly opposed to such powerful, unaccountable forms of decision-making. To the extent that the figure of the Engineer is the tool user, the toolkit is dangerous.

From Chambers' perspective, however, the enlightened user of the toolkit can achieve a different outcome; tools are figured as neutral and emancipating when given *to* the right people *by* the right people, and the result would be the scalable development of both the professional agent and the impoverished subject of development.

DEVICE, TOOLKIT, ALGORITHM

What is at stake in thinking of the Participatory Development Tookit as a "quasi-algorithm"? What might be the difference between a briefcase of paper games and routines for eliciting participation, and a piece of software that tries to do something similar, but is implemented on a solar-powered, GPS-enabled, data-intensive smartphone app? Can we see this kit as a vantage point from which to evaluate the contemporary explosion of various devices for development, especially those that demand the input of users concerning local conditions

Activity #6, Diagrams 1–3, (Narayan-Parker and Srinivasan 1994)

Open Ended Snakes and Ladders; Activity #24 in (Narayan-Parker and Srinivasan 1994, pp. 54–55)

convoking individuals to elicit debate, deliberation, opinion, or decision-making (Lee 2014; Lezaun and Soneryd 2007).

The toolkit is not, however, immaterial as a result. The material properties of the Participatory Development Toolkit are important; it is meant to travel, it has a handle, and it carries both its theory and its practice in easily accessible compartments and a handy users' manual. The toolkit is not a device itself, but more like a "platform": a box full of different devices all dependent on a similar form of action and general theory of participation. These devices are not technologically sophisticated, but neither, really, are most apps or software programs. They may depend on a technologically sophisticated infrastructure (to exist), but at the end of the day they are simple programs: devices designed to achieve particular results. What is the relation between the participating humans and the toolkit? In the toolkit, the games and images and scripts call on people to interact in specific ways. The development agents, along with those they interact with (villagers, women, engineers, farmers, politicians), are given rules, or shown images, or follow loose scripts for "non-directive" interaction with each other. The goal, or outcome, is to either diagnose a problem or propose solutions to it. It does not solve a problem diagnosed elsewhere, higher up or far away, without the involvement of people, but presumes instead that the diagnoses of a problem itself has yet to happen, or that the proposed solutions must come from the context-specific encounter itself.

This is the origin of its power: it promises a highly context-dependent exploration of problems specific to those who meet and engage in the production of these experiences. This is why it enrolls people into its project. The conundrum comes from the fact that the devices for eliciting such experiences are (perhaps unwillingly) universalized in the toolkit, made to travel. Whereas an individual development consultant might bring a set of techniques and procedures with her to a variety of (necessarily limited) places, the Participatory Development Toolkit implicitly suggests that through replication, many more people can carry these procedures to many more places.

What's more, it is not merely a

while using standard forms and algorithmic procedures to scale up and travel?

One obvious thing to say about the Participatory Development Toolkit is that it does not contain tools or supplies of a conventional kind. There are no hammers, pliers, or wrenches; there are no Band-Aids, gauze, or Bactine as there would be in a first aid kit; it is not quite the "kit" pioneered by Médecins Sans Frontières capable of unfolding an emergency treatment center in a remote or decimated location (Redfield 2013:69ff). Instead, it contains scripts, games, and procedures designed to elicit experiences. When opened and set into operation, it tries to create a joyful occurrence: people are called to draw pictures, make maps, play a game, or discuss a problem related to their immediate life experience and surroundings. In this respect, its "devices" are similar to what Soneryd and Lezaun call "technologies of elicitation," or what Caroline Lee refers to as "do-it-yourself" or "designer" democracy; they are procedures and practices of

toolkit-as-commodity being replicated; it is also a toolkit funded by and branded with the insignia of the World Bank and the UNDP. These institutions make participation more or less bureaucratic, and authorize them as forms of practice. It is not clear that the Participatory Development Toolkit was *required* in any way, but along with manuals such as the World Bank *Participation Sourcebook* (World Bank 1996) the techniques and procedures were incorporated into the standardized practices of development. One can find the same games and scripts in the *Sourcebook* that appear in the Participatory Development Toolkit.

The institutional standardization of participation is what provokes the suspicion of the toolkit itself, in cases such as Francis Cleaver's critique above; rather than a highly contextualized participatory engagement, it suggests instead a bureaucratically standardized set of forms and practices, riven from the context. Soneryd makes a similar point in discussing more recent "technologies of participation": it is not an accident that this standardization happens precisely because many actors in these organizations actively seek to "imitate and replicate" forms of participation that have worked elsewhere (Soneryd 2016:149).

Such institutional embedding (to use the new institutionalist language) is not dissimilar to the kind of infrastructural "network effects" (to use the engineering/economic language) of internet-based apps and platforms that similarly circulate plans, techniques, and procedures in the interest of producing an experience. As the kit succeeds, it draws more people into a particular form of participation, and produces professionals and networks of practice that draw on these tools as exemplary forms of participation. Both aim at scaling up and circulating the local without losing (the character of that) local specificity. But such tools are inevitably subject to both technological and institutional mimcry, standardization, and control, whether that be an audit culture of measuring results or an advertising-dependent system of revenue generation.

The Participatory Development Toolkit represents a stage in this evolution. It is "quasi-algorithmic" but not fully routine in the sense that it does not operate automatically, in the absence of context, judgment, or serendipity. Nor is it "computational" in any sense. Rather, a development agent takes the place of the networked computer: he or she runs the program (as a neutral agent: a CPU, as it were) and records the data into memory. The users of the algorithm are the participants: villagers, women, extension agents, etc. They give their data and ideas to the machine in the hope that it will spit out a solution and perhaps some money.

The term "algorithm" used to mean a set of rules, not unlike a recipe, or the rules of a game. In this respect, the operator is like a player or a chef: some are good and some are bad. Robert Chambers' desire to see development agents remake themselves as agents of participation relies on such a notion: you can have the best recipes in the world, and still produce a bad meal.

Lately, however, the "algorithm" has come to mean something more than just a set of steps. Rather, it is a kind of living system that depends both on computational processing of recipe-like rules, and on the constant input of many participants: participants who feed it regularly, not just use it. The Facebook timeline, to take only the most storied case, depends both on a large set of rules of searching, sorting, and comparing possible content, and on an always-changing database of what people who are connected to other people view, like, linger upon, or swipe past. This is not the same thing as a simple set of rules that depend on expert execution; rather, it seems to enable a certain fantasy of—and provoke a certain desire for—participating in an enormous, amorphous, yet nevertheless intimate collective that represents itself to itself constantly.

In its ideal version, this happens completely without human control or intervention, making the local into a universal. In reality, such "automation" reproduces the good and the bad of the local (as Facebook, Twitter, and others are discovering in the case of the 2016 U.S. election), and a reversion to the former meaning of algorithm becomes more appealing again.

Seen from this perspective, the Participatory Development Toolkit is an interesting moment in the development of devices for development. It is perhaps more like the algorithm-as-recipe in its quaint leather-bound form, but perhaps it also betrays a desire for the newer algorithm-as-system in which all over the world, people are enabled to participate constantly in the diagnosis and solution of their own problems. Or maybe it should be seen from the success of the contemporary demand for constant, unreflective participation of the sort promoted by social media. Perhaps it reveals a now nearly forgotten desire for scaling up something difficult to scale up: the reflexive practitioner whose "algorithm" is human judgment, memory, and discernment, and not an automatic, machine-learning, artificial intelligence. Perhaps it reveals a present danger of an endless participation without deliberation, whereas the analog briefcase could still, at least, contain a trace of the reflexive practitioner, the Marxist pedagogue, or the evangelical development aesthete. ■

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BIBLIOGRAPHY

Alden, Jenna. 2012. "Bottom-Up Management: Participative Philosophy and Humanistic Psychology in American Organizational Culture, 1930-1970" [PhD dissertation]. Columbia University Academic Commons. New York, NY: Columbia University.

Chambers, Robert. 1983. *Rural Development: Putting the Last First.* World Development Series. Newark, NJ: Prentice Hall.

———. 1994. "The Origins and Practice of Participatory Rural Appraisal." *World Development* 22(7):953-969.

Cooke, Bill, and Uma Kothari. 2001. *Participation: The New Tyranny?* London, UK: Zed Books.

Cornwall, Andrea, and Ian Scoones. 2011. *Revolutionizing Development: Reflections on the Work of Robert Chambers.* Oxon; New York: Earthscan.

Freire, Paulo. 2014. *Pedagogy of the Oppressed: 30th Anniversary Edition.* Originally published 1970. London, UK: Bloomsbury Publishing.

Green, Maia. 2014. *The Development State: Aid, Culture & Civil Society in Tanzania.* Suffolk, U.K.: James Currey.

Kelty, Christopher M. 2017. "Too Much Democracy in All the Wrong Places: Toward a Grammar of Participation." *Current Anthropology* 58(S15):S77-S90.

Lee, Caroline. 2014. *Do-It-Yourself Democracy: The Rise of the Public Engagement Industry.* New York, NY: Oxford University Press.

Lezaun, Javier, and Nerea Calvillo. 2014. "In the Political Laboratory: Kurt Lewin's Atmospheres." *Journal of Cultural Economy* 7(4):434-457.

Lezaun, Javier, Noortje Marres, and Manuel Tironi. 2016. Experiments in Participation. In *Handbook of Science and Technology Studies*, edited by Ulrike Felt, Rayvon Fouché, Clark A. Miller, and Laurel Smith-Doerr, pp. 195-222. Cambridge, MA: MIT Press.

Lezaun, Javier, and Linda Soneryd. 2007. "Consulting Citizens: Technologies of Elicitation and the Mobility of Publics." *Public Understanding of Science* 16(3):279-297.

Narayan-Parker, Deepa, and Lyra Srinivasan. 1994. *Participatory Development Tool Kit: Materials to Facilitate Community Empowerment.* Compiled by Deepa Narayan-Parker and Lyra Srinivasan. 221 activity cards, 65 pictures, 11 charts, 1 guidebook in briefcase; 26 ´ 33 ´ 10 cm. Washington, DC: World Bank.

Pearse, Andrew, and Matthias Stiefel. 1979. "Inquiry into Participation: A Research Approach." Technical report UNRISD/79/C.14 GE.79-2103. Geneva, Switzerland: United Nations Research Institute for Social Development.

Reason, Peter. 2008. *The SAGE Handbook of Action Research: Participative Inquiry and Practice.* Los Angeles, CA, and London, UK: SAGE.

Reason, Peter, and Hilary Bradbury. 2001. *Handbook of Action Research: Participative Inquiry and Practice.* London, UK: Sage.

Redfield, Peter. 2013. *Life in Crisis: The Ethical Journey of Doctors Without Borders.* Berkeley, CA: University of California Press.

———. 2016. "Fluid Technologies: The Bush Pump, the LifeStraw®, and Microworlds of Humanitarian Design." *Social Studies of Science* 46(2):159-183.

Sawyer, Ron. 2011. "SARAR: A Methodology by Lyra Srinivasan." *Culture Unplugged.* http://www.cutv.ws/documentary/watch-%3C/a%3Eonline/play/12780/SARAR%E2%80%93a-methodology-by-Lyra-Srinivasan

Soneryd, Linda. 2016. "Technologies of Participation and the Making of Technologized Futures." In *Remaking Participation: Science, Environment and Emergent Publics*, edited by Jason Chilvers and Matthew Kearnes, pp. 144-161. London, UK, and New York, NY: Routledge.

Srinivasan, Lyra. 1990. *Tools for Community Participation: A Manual for Training Trainers in Participatory Techniques.* New York, NY: PROWWESS/United Nations Development Program.

World Bank. 1996. *The World Bank participation sourcebook.* Washington, D.C. : The World Bank. http://documents.worldbank.org/curated/en/289471468741587739/The-World-Bank-participation-sourcebook

World Bank. 2001. *World Development Report 2000/2007: Attacking Poverty.* World Development Report. New York: World Bank.

ITERATE, EXPERIMENT, PROTOTYPE

Anke Schwittay and **Paul Braund** explore the curious intersection between international aid and design.

INNOVATION BY DESIGN

In 2012, the United Kingdom's Department for International Development (DFID) launched its Innovation Hub (i-Hub). It thereby followed a trend among development actors who see innovation, broadly defined as generating new ideas leading to large-scale solutions, as crucial to increase the impact of their interventions. In the words of Judith Rodin, former long-time president of the Rockefeller Foundation, "Innovation alone will not solve all of the problems facing humanity, but we certainly won't solve many without it" (2016:6). In contrast to mainstream innovation that does not pay attention to existing inequalities and can thereby exacerbate them, academics and practitioners are increasingly using the term "inclusive innovation" to describe innovation practices that explicitly aim to improve the lives of marginalized groups. Having subsumed terms such as "pro-poor," "below-the-radar," "grassroots," or "frugal innovation," inclusive innovation refers to "the inclusion within some aspects of innovation of groups who are currently marginalized," either through products and services developed specifically for them, their incorporation into the innovation process, or support for their own grassroots innovation efforts (Foster and Heeks 2013: 335).

This innovation turn is often joined by the embrace of humanitarian design, which is the application of design methods to development ends or—as designers would say—to change what is into what ought to be. Humanitarian design has its historical roots in longstanding alternative design traditions such as universal, ecological, or feminist design. E. F. Schumacher's *Small*

is Beautiful (1973) and Victor Papanek's *Design for the Real World* (1984) called for the use of socially and environmentally responsible technologies and design. Papanek himself designed a 9-cent radio made of a used tin can and powered by wax or animal dung burned underneath it, which was distributed by UNESCO in India and Indonesia. The tin-can radio can be seen as an early humanitarian device and the forerunner of the hand-crank or solar-powered radios now ubiquitous in many places in the Global South. More recently, when Melinda Gates and Paul Farmer were asked what they saw as the innovation that is changing most lives in the developing world, they answered, "human-centered design," in reference to a particular brand of humanitarian design advocated by IDEO.org (*Wired* 2013).

IDEO.org is the nonprofit subsidiary of IDEO, a Silicon Valley–based international design consultancy that has been one of the most successful commercial entrants into the humanitarian design space. Its DesignKit website (www.designkit.org) provides popular online courses, field guides, and case studies. Through these free resources and articles in leading magazines such as the *Stanford Social Innovation Review*, IDEO has played an important role in legitimizing the participation of professional designers in the development enterprise. In the latter publication, IDEO Chief Executive Officer Tim Brown and IDEO.org Executive Director Jocelyn Wyatt argue, "Time and again, [development] initiatives falter because they are not based on the client's or customer's needs and have never been prototyped to elicit feedback" (Brown and Wyatt 2010:31). By branding its own approach as human-centered design (HCD), IDEO.org makes explicit—and appropriates more visibly than other organizations in this space—the critical centrality of user perspectives in humanitarian design.

Part of the legitimation process of humanitarian design is redefining the development problem as a shortage of creative ideas, flawed system design, and preconceived notions of development practitioners (Schwittay 2014). In addition, advocates of humanitarian design point out that the complexity and fast-paced nature of today's development challenges calls for innovative, creative, and integrative experts—designers in short—who are best placed to tackle the problem of persistent poverty. Part of their approach is to redefine common constraints,

such as poor people's inability to pay for necessary services, as "creative springboards" and to redefine poor people's needs as (commercial) opportunities. This vision of development is based on a conceptualization of the poor as consumers and an individualization of infrastructural problems, both hallmarks of humanitarian goods.

AMPLIFYING DEVELOPMENT

In 2014, DFID's i-Hub contracted IDEO.org to the tune of £10 million to develop and implement its flagship program, Amplify (www.amplify.org). Amplify is a crowdsourcing platform aimed at engaging nontraditional development actors such as designers and other creative entrepreneurs, diaspora communities, technologists, engineers, and the public at large. It also wants to establish stronger connections between these actors

FIGURE 1
Image from IDEO.org 2016 Impact Report *"Design: We improve the lives of people in poor and vulnerable communities through the solutions we create."* IDEO

FIG. 2 (TOP).
Participants in the 2016
Amplify Bootcamp in
Kampala, Uganda.

**FIG. 3 (BOTTOM LEFT
AND RIGHT).**
From the prototype
phase.

socio-technical spaces that enable diverse and dispersed groups of people to collaborate on joint projects. Amplify itself consists of eight challenges, with topics ranging from women's safety in urban areas to improved refugee education to youth empowerment in East Africa and enhanced opportunities for people with disabilities. Each challenge goes through a four-month online process, at the end of which a handful of winners attend a design bootcamp, usually held in Nairobi or Kampala, and receive upwards of £100,000 in DFID funding and IDEO design support to implement their ideas. To date, seven challenges have been completed, which allows us to examine if and how the program's use of open collaboration and humanitarian design have been changing DFID's modus operandi. Our analysis is based on more than 2 years of qualitative research, encompassing in-person and Skype interviews with three DFID managers, five IDEO managers, and 15 participants, predominantly finalists of the first four challenges. We also conducted detailed numerical and discourse analysis of three challenges through online research and examined secondary materials such policy papers, a business plan, blog posts, YouTube talks, and online meet-ups.

Most obviously, the Amplify application process differs significantly from DFID's traditional Requests for Proposals. The latter ask for precisely defined project descriptions and timelines, budgets, and objectives, all presented in development jargon that from the outset narrows the pool of applicants to those able to comply with these requirements. Instead, Amplify's more flexible and open-ended process emphasizes learning and iteration. Most participants—theoretically anybody with an internet connection can set up a short profile and join the platform, although there are clearly structural constraints to participation—post preliminary ideas on the Web2.0-type website. There are a number of free-form text boxes where participants answer open-ended prompts such as, "Explain your idea," "Who benefits?" and "How is your idea unique?" In addition, dropdown menus provide more precise information about the participants themselves on, for example, years of experience in the country for which the idea is being proposed, expertise in the sector, and size of operating budgets. Although written text, which has to be in English, dominates the submissions, participants are also encouraged to embrace more

and potential users of the development solutions generated via the platform. By definition, these users are constituted as poor to fit DFID's mandate. Reflecting the hyperbole that often surrounds the uptake of innovation and design in development, Amplify's business plan marketed the program to DFID senior management as a "platform [that] could galvanise truly transformational and unprecedented innovation by attracting new sources of expertise" and the use of collaboration (Amplify 2013). Indeed, Jonathan Wong, former head of i-Hub, reports that thanks to Amplify, HCD is diffusing across DFID and other UK government departments (IDEO.org 2016). This is also a process of making visible the informal and unseen practices already happening at the margins of many development organizations, of mainstreaming them and showing their potential contributions to DFID's work.

The Amplify platform has been adapted from the original OpenIDEO platform, which was built to stimulate "open innovation" and uses proprietary software and a Creative Commons license. Calling it an online platform rather than a website highlights such crowdsourcing devices as

1. LOCATE

Strategically co-locate <u>Community Scale Plans and Markers</u> within larger plan in consultation with community groups and government partners. Demonstrate how the approach fits into a larger phased settlement scale plan,
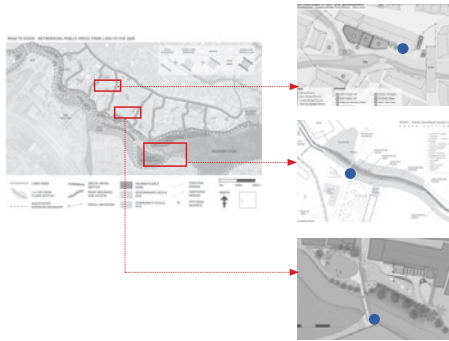
2. BUILD

Build markers in three locations to communicate flood-risk, provide community amenity and raise flood awareness internally and externally.

3. NETWORK

Use the flood-markers as a spur for public space development. Assess which projects could be delivered under which models (i.e. community/NGO/Gov financed/managed) and how community participation and agency can be integrated in each.
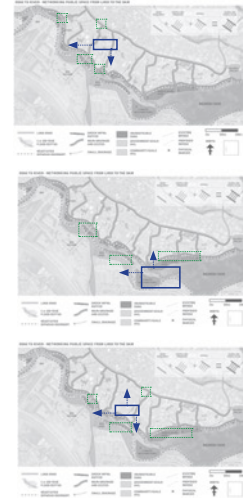
visual language by posting photos and short videos. All shortlisted participants have to provide a user-experience map to chart how potential users of their idea would participate in the proposed project. Initial submission can easily be changed using a simple editing function in response to questions and comments from other participants and IDEO.org managers, which are displayed in a comment section.

This online process is structured according to the HCD process of Ideas–Feedback–Improvement, which asks that participants show how comments and other feedback are shaping the evolution of their ideas. Although this structure imposes its own logic, it is miles away from the conventional log frame (logical framework) used by many development organizations. Whereas log frames demand that information is presented in boxes, organized by technical terms such as inputs, outputs, and outcomes, the design process operates through freeform, flexible thinking and writing to produce more open-ended submissions. Several participants we interviewed welcomed this move toward a more realistic process for formulating and implementing development projects, which

one participant described as "learning rather than proofing." Such learning also takes place at the level of the program, as Amplify itself has been conceived as one large prototype where continuous adjustments are made from one challenge to the next.

Amplify's aim has always been to fund small organizations that DFID, which channels most of its aid through large international nongovernmental organizations (NGOs) or consultancies, is not usually able to support. An examination of the 30 winners of the first five challenges shows that just over half are nonprofit/NGO-type organizations, eight are social enterprises, three are professionals, and another three are design groups. A group of New York University (NYU) design students won the first challenge with a project developed in collaboration with a Nepalese NGO they had met on the website; this was celebrated in a newspaper article as being exactly what Amplify was about (Leach 2015). However, an IDEO manager complained to us that the program should instead be supporting Kenyan design students and connecting them to Kenyan social enterprises. He was not so much objecting to the fact that funds went to the United

States rather than target countries (most of the money was channelled via NYU to the Nepalese organization), but that the U.S. students did not know much about what is going on in Nepal. It is through such internal debates that small, community-based organizations have emerged as the "sweet spot" targeted by Amplify, showing how inclusive innovation and open collaborative practices can generate their own politics of exclusion. In the fourth challenge, a Kenya-based design group called KDI did win, with a project to work with Nairobi slum dwellers to redesign open spaces to prevent flooding.

SMALL EXPERIMENTS

i-Hub's first head has described Amplify as "less like *Encyclopaedia Britannica* and more like Wikipedia" (Wong 2016:125). For him, development knowhow is no longer created in traditional centers of power, which instead "curate" knowledge production in multiple locations around the globe. However, the above description of what is new about the program also reveals some of its continuities with more conventional development regimes. Most important, Amplify expertise remains firmly situated in the Global North, with IDEO.org designers in New York and San Francisco, DFID managers in London, and unnamed subject experts who ultimately chose the winning ideas. This replication of authoritative development geographies can also be seen in the location of the finalists. Although all of the winners of the first five challenges are based in the Global South, 24 of 30 have a connection to the Global North, with 19 to the United States. Close to 50% of all winning projects are located in Kenya, despite the fact that 27 of DFID's priority countries are eligible for Amplify support. The sixth challenge focused on four countries in East Africa only, narrowing down Amplify's professed diversity to long-established sites of UK development interventions.

Amplify is also subject to a tension at the heart of the design endeavor. On the one hand, there is an insistence that everyone is a designer because design is a fundamentally creative, human activity, which awkwardly stands counter to claims by professional designers that they possess the right qualifications, skills, and methods to solve the world's problems. Although everybody who logs onto the Amplify website has to participate in its designer-y process, it is IDEO.org employees who are the program experts.

Such an appropriation of expertise resonates with condemnations of humanitarian design as "soft cultural imperialism" operating through neoliberal narratives about poverty and the use of techno-scientific market devices to solve it (Johnson 2011:463). However, one characteristic of humanitarian design is precisely the ever-closer entanglement of markets and morals (Redfield 2016). In addition, it is Silicon Valley's techno-utopian and libertarian values that shape Amplify's operations and thereby seep into broader international development efforts.

Accordingly, Amplify's business plan celebrates its "start small, test, and fail early" mentality (Amplify 2013). Continuous experimentation is encouraged throughout the online process and especially among finalists. In our interviews, some participants recognized the challenges that such an experimental logic can present in the complex world of development, where vulnerable livelihoods leave little room for creative destruction. There is also a qualitative difference between the beta version of the latest geolocation app failing in tests with a consumer focus group, and the implications of discontinuing a project that was providing important community services. In one case, Amplify managers urged a finalist to introduce a new employment skills project requiring substantial upfront investment in equipment against the finalist's own judgment that it would not be economically sustainable in the long run. Having to abandon the project after the three-month period supported by a small Amplify grant resulted in confusion and disappointment among its users. The organization's own frustration echoes critiques that humanitarian designers, in their search for marketable innovations, sometimes do not pay enough attention to financial sustainability and organizational cultures (Mulgan 2014).

Above all, Amplify operates as a micro-social generator, incubating interventions at a micro scale. It combines the qualities of a social networking platform (like Facebook/Linkedin) with the features of an open-editable content platform working through the small contributions of numerous individuals and groups and overseen by a group of administrators (like Wikipedia). By design, it supports small organizations producing local solutions that improve the lives of individuals, their families, and their neighborhoods. On the one hand, this results from the nature of design. DFID managers recognized in our

interviews that design can only tackle more technical problems, and Amplify was always aimed at particular locales rather than universal coverage. This is not to say that it does not have global ambitions, as scalability is something experts look for in winning ideas. Indeed, one finalist of the Refugee Education challenge, a Jordanian organization called We Love Reading, is aiming to build a global movement to get more children to read for pleasure. But it also remains firmly rooted in its local origins: it started in a neighborhood mosque in Amman, and works through one reading circle at a time.

On the other hand, micro is the scale of humanitarian devices, and similar to these devices, most winning ideas on Amplify advocate for solutions standing apart from state infrastructures or authorities. Working at an individualized and individualizing level, they deploy technical minimalism in the face of immediate needs. They also often create "micro-scale market opportunities" while presenting "small...approaches to social change" (Redfield 2016:179). How has this translated into the production of humanitarian goods?

DESIGNING HUMANITARIAN DEVICES

Among the winners were certainly devices that fit the inclusive innovation remit with its focus on newness: a clean birth kit for poor Indian mothers, a biogas-powered milk chiller for Tanzanian farmers, novel storage solutions for Ethiopian market vendors, a market-matching chatbot connecting Kenyan poor farmers with buyers, and a peer-to-peer SMS-based information network to alert Jakarta inhabitants to floods. But the great majority of winning projects have been quite conventional, from employment training schemes to microfinance to community health initiatives and educational programs. This reflects Amplify managers' self-professed scepticism towards technological silver bullets and existing expertise within DFID more broadly, which ultimately limits what can be funded. Equally important, because of the organization's value-for-money mentality stemming from its fiscal responsibility to UK taxpayers, initial blue-sky thinking has made way to safer ideas and organizations. Has this resulted in poor—rather than pro-poor—innovations, foregoing breakthroughs for incremental change? Although Amplify's outcomes might be familiar, the process by which they have been achieved is certainly
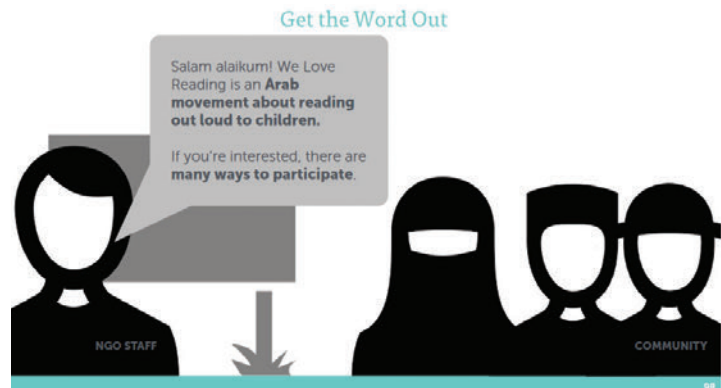
new to DFID, many of the winners, and the platform's observers.

And what if we regarded design as a particular, "remedial" approach to changing situations whose status quo cannot be accepted, as suggested by Bruno Latour (2008)? Then, rather than being revolutionary, humanitarian design can be seen as careful in a double sense: on the one hand it can only present limited solutions to clearly circumscribed problems, and on the other it is infused with an ethics of care that accords well with the affective dimension of contemporary humanitarianism and the popular embrace of poverty alleviation causes. It can be seen as an approach to international development whose practitioners wonder whether they are asking the right questions where others have ready-made answers, who examine the assumptions that most development interventions take for granted, and who hold in view the messiness and complexity of any project of change, ultimately recommending to proceed with caution. Likewise, for researchers of these approaches, rather than subscribing to the well-trodden critique of neoliberal market dominance, might an agnostic stance that explores their potential while acknowledging their limits be more productive? ■

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FIG. 5. Image from presentation prepared by IDEO.org for We Love Reading.

BIBLIOGRAPHY

Amplify. 2013. Business Plan. https://
devtracker.dfid.gov.uk/projects/
GB-1-203798/documents

Brown, Tim, and Jocelyn Wyatt. 2010.
"Design Thinking for Social Innovation."
Stanford Social Innovation Review
8(1):31–35.

Foster, Christopher, and Richard
Heeks.2013. "Conceptualising Inclusive
Innovation: Modifying Systems of
Innovation Frameworks to Understand
Diffusion of New Technology to Low-
income Consumers." *The European
Journal of Development Research* 25(3):
333–355.

IDEO.org. 2016. *Impact: A Design
Perspective.* https://www.ideo.org/
impact

Johnson, Cedric. 2011. "The Urban Precariat,
Neoliberalization, and the Soft Power
of Humanitarian Design." *Journal of
Developing Societies* 27(3–4):445–475.

Latour, Bruno. 2008. "A Cautious
Prometheus? A Few Steps Towards
a Philosophy of Design (with Special
Attention to Peter Sloterdijk)." In
*Proceedings of the 2008 Annual
International Conference of Design
History*, pp. 2–10. Boca Raton, FL:
Universal Publishers.

Leach, Anna. 2015. "Collaboration Not
Competition: Could This Be the Future
of Development?" *The Guardian,* April
14. https://www.theguardian.com/
global-development-professionals-
network/2015/apr/14/collaboration-
not-competition-could-this-be-the-
future-of-development

Mulgan, Geoff. 2014. "Design in Public
and Social Innovation: What Works
and What Could Work Better." https://
www.nesta.org.uk/sites/default/.../
design_in_public_and_social_
innovation.pdf

Papanek, Victor. 1984. *Design for the Real
World: Human Ecology and Social
Change.*Chicago, IL: Academy Chicago
Publishers.

Redfield, Peter. 2016. "Fluid Technologies:
The Bush Pump, the LifeStraw® and
Microworlds of Humanitarian Design."
Social Studies of Science 46(2):159–183.

Rodin, Judith. 2016. "Foreword."
In *Innovation for International
Development: Navigating the Paths and
Pitfalls*, edited by Ben Ramalingam and
Kirsten Bound, pp. 6–7. London, UK:
NESTA.

Schumacher, Ernest Friedrich. 1973. *Small
is Beautiful: A Study of Economics as if
People Mattered.* US: Random House.

Schwittay, Anke. 2014. "Designing
Development: Humanitarian Design in
the Financial Inclusion Assemblage."
*PoLAR: Political and Legal Anthropology
Review* 37(2): 29–47.

Wired. 2013. Interview with Melissa Gates
and Paul Farmer. https://www.wired.
com/2013/11/2112gatefarmers/

Wong, Jonathan. 2016. "From Britannica
to Wikipedia: How Traditional
Development Players Are Catalysing
Collaboration for Innovation."
In *Innovation for International
Development: Navigating the Paths and
Pitfalls*, edited by Ben Ramalingam and
Kirsten Bound, pp. 120–130. London,
UK: NESTA.

GOVERNING DEVELOPMENT FAILURE

How did little development devices make their way into big development institutions? **Jacqueline Best** explores the history of policy failure at the World Bank.

IN THE LAST FEW YEARS THERE HAS BEEN A PROLIFERATION of new "little development devices" and practices in places where we might least expect them: at the World Bank and in national development agencies usually associated with the kinds of large-scale infrastructure mega-projects that these institutions pioneered after World War II. Yet the current emphasis on "little" development devices cannot be understood as a straightforward reaction to earlier forms of development policy that used "big" development devices. Rather, if we want to understand the current fascination with little development devices, we need to look at a different moment in international development institutions' history: the many prominent failures in development assistance that marked the 1990s, such as the AIDS epidemic, the Asian financial crisis, and the "lost decade" of development in sub-Saharan Africa.

If we cannot understand the emergence of these new devices without paying attention to the recent failures of development policy, does that mean that they signal the failure of international development as we've known it? Yes and no: yes because many of them have been developed as innovative responses to the failures of development assistance, and no because they are nonetheless still very much *development* devices aimed at many of the same objectives that have held sway since the mid-twentieth century, including economic growth and poverty reduction.

In fact, although policy failures are central to this story, the part they play is a surprisingly creative one. These failures were profound enough to provoke a crisis of development expertise, leading development practitioners to question their very metrics of success and failure. Over time, these practitioners sought to re-establish the grounds for their authority, reconceiving the object of development—poverty—by forging new metrics of aid success, by developing new techniques for its measurement, and by adopting new devices amenable to this kind of measurement.

Rather than the failure of development, what precipitated the proliferation of these new micro-devices was thus the transformation of development governance through its engagement and problematization of failure, as well as its growing preoccupation with the ever-present possibility of future failures.

RESPONDING TO PAST FAILURES

Beginning in the 1990s, there was a lot of talk about the failure of development policies. Some external critics focused on the persistence of extreme poverty in sub-Saharan Africa, while others pointed to the AIDS crisis in Africa, or the sudden increase in poverty in Asia after the 1997–1998 financial crisis. All of these crises had occurred on the watch of the major development organizations in spite of (or, as many critics suggested, because of) their efforts.

Inspired by these crises, both external critics and many of those working in the policy development and evaluation units at the World Bank and the International Monetary Fund (IMF) began to point to various policy failures (Collier 1997; Killick 1997). Staff in the Policy Development and Review department at the IMF, for example, noted that the ever-increasing number of conditions that aid packages imposed on poor countries had no positive effect on compliance, and were significantly reducing borrower governments' "ownership" of the reforms (Boughton 2003). Meanwhile, the World Bank's Operation Evaluation Department's (OED) assessments

were pointing to dramatically declining success rates—from 80% to 85% in the 1980s to less than 65% in the 1990s (OED 1994), figures that were of great concern to World Bank president James Wolfensohn.

One of the underlying targets of these criticisms was the policy framework known as the "Washington Consensus," a broadly neoliberal approach to development that put growth at its core and saw the market as the best way of achieving development goals (e.g., Stiglitz 1998:1). Yet, even as the World Bank dedicated its 1997 flagship World Development Report to the "rediscovery" of the state after two decades of denigrating or denying its role, the report was also very careful to distinguish the World Bank's present strategy from earlier state-led approaches to development, arguing for the need to "take the burden off the state by involving citizens and communities in the delivery of core collective goods" (World Bank 1997:3).   Treating both state- and market-dominated approaches as failures, the World Bank has pursued a middle way between the two, forging new and dynamic assemblages of public and private actors, claims, and practices to simultaneously pursue public goals and private interests (Best 2014a).

CONTESTED FAILURES

Of course, policy failures occur all the time. Sometimes they are perceived as failures, and sometimes they are ignored. Yet occasionally they become what I call "contested failures": failures important enough to produce widespread debates about the meaning of success and failure and the metrics through which we evaluate them (Best 2014b). The concept of contested failure is connected to what Andrew Barry calls "knowledge controversies," in which the metrics that are usually taken for granted become, for a time, politicized (Barry 2012).

These are interesting moments when we confront them in our everyday lives. Many of those of us who teach for a living, for example, have confronted a set of exams that fall so far below our expectations that they force us to re-evaluate our conceptions of success and failure (and, at least in my case, to change the assignment altogether). Such contested failures are fascinating moments in politics because the question of what counts as success is both highly technical—involving questions of evaluation and calculation—and normative—raising the question of what we value enough to define as success.

The "aid effectiveness" debate that emerged in the 1990s and early 2000s was a classic example of this kind of contested failure, as its participants responded by problematizing and ultimately rethinking what makes aid succeed or fail. This widespread debate, which included practitioners, nongovernmental organizations (NGOs), academics, and politicians, raised important questions about why aid did not seem to be working, and ultimately produced some rather different definitions of what counts as successful development (World Bank 1998).

NEW DEFINITIONS OF SUCCESS

The new definitions of success that began to take hold from the late 1990s onward were somewhat paradoxical.

On the one hand, the conception of success that began to emerge was far bigger and messier than it had been in the past. In the place of narrowly economic definitions of effectiveness, agencies now sought to pursue a much broader and longer-term set of objectives, recognizing that economic development is inextricably linked to political, social, and cultural dynamics that are often particular to a given country or region. For example, development staff hoped to achieve a much greater level of "country ownership" over the policies that they believed needed to be pursued, seeking to encourage domestic engagement by various stakeholders. Their goal was to build political support for ambitious, longer-term institutional reforms, whether through (at least somewhat) participatory consultations or community-driven development.

On the other hand, the metrics for measuring success became increasingly narrow, particularly as the enthusiasm for results and outcomes-based evaluation began to grow in the 2000s. These new metrics sought to respond to (and reduce) the ambiguities produced by the expanded conception of development objectives by making them more readily quantifiable. If development policymakers and aid ministers were no longer able to point to a school or dam to show where the dollars had gone, at least (the theory went) they could point to a measureable result that affirmed a direct line of causality between policy, output, and longer-term outcome.

Not surprisingly, one of the effects of this drive to make aid outcomes measurable has been to create incentives for pursuing policies that are easier to measure. For example, the "cash on delivery" approach, developed in 2006 by the U.S.-based think tank Center for Global Development, promises to pay a set amount for each "unit" of an agreed result. One pilot project developed by the British Department for International Development (DFID) in Ethiopia pays the government £50 for each student who sits a particular exam, and £100 for each one who passes it. This kind of fixation on measurable results creates a proliferation of policies aimed at getting students in exam seats and bed-nets on beds while driving policymakers away from the kind of complex, messy conceptions of development success that the aid effectiveness debate had revealed to be so important.

NEW MICRO-DEVICES: POVERTY, CASH TRANSFERS, AND MICROCREDIT

Many of the devices and practices that emerged in the years since the aid effectiveness debate reflect this hybrid character. Although the large-scale, macro-level ambitions of market-led development and poverty reduction remain at the heart of these policies, they are now increasingly pursued through more cautious, smaller-scale, micro-level techniques. This does not

just mean that these interventions address the same targets at a smaller scale. Rather, the embrace of these new techniques of intervention corresponds to a new ontology of the object of development.

One area in which we can clearly see this combination of macro-ambitions and micro-techniques is in efforts to reduce poverty. Part of what development researchers and practitioners found so unsettling about the Asian financial crisis and AIDS crisis was how these events pushed huge numbers of people *back* into poverty, undoing decades of progress. Led by the Social Protection Unit at the World Bank shortly after its creation in 1996, a number of aid agencies began to move away from static conceptions of poverty that generally assumed once an individual or family moved out of poverty they would stay that way (World Bank 2001a). These policy failures forced aid practitioners to rethink poverty on an ontological level, seeing it as a dynamic process rather than a static state (Best 2013). Staff working on social protection at the World Bank sought to redefine poverty as social risk and vulnerability, and to devise a range of more flexible devices in response. This approach to poverty reduction ultimately became a core part of the influential 2000–2001 World Development Report *Attacking Poverty*, and has been adopted by a number of other organizations, including the DFID and the Organisation for Economic Co-operation and Development (OECD; World Bank 2001b).

The logic of the social risk approach is straightforward: in a volatile and unpredictable world where political, economic, climate, and health crises are always possible, poverty-reduction policy needs to help individuals and communities become better risk managers, capable of preparing for and responding to external shocks. Because some risks are covariant (affecting a large community or even the entire national population), traditional forms of insurance may not be effective because they were designed to respond to idiosyncratic risks (such as a single individual's health difficulties, or a house fire). The state therefore becomes an important part of the solution, but only as one actor among many, resolving problems of market failure, supporting and combining with private sector initiatives, and enabling individuals to become more active in managing their own risks.

Some of the most popular devices for managing poor people's vulnerability to poverty, including conditional cash transfers (CCTs) and microcredit initiatives, clearly reflect this hybrid public-private, micro-level focus. CCTs are state-provided funds targeted toward very poor populations, particularly women, generally on the condition that they keep their children in school and bring them in for regular health check-ups. The funds are supposed to help poor people respond to immediate shocks, whereas the conditions are aimed at increasing the resilience of future generations and improving their chances of becoming better risk managers.

Microcredit initiatives, which provide very small loans to people who would not qualify for conventional credit, started out as state and NGO-funded programs but have become increasingly market (and profit) driven in recent years. Their objective is to provide poor individuals with the kind of financial credit that they need to actively take "good" economic risks (such as investing in education or an entrepreneurial activity), in the belief that this will allow them to become more active and autonomous participants in the market economy.

As the World Bank's first Social Protection Strategy's title made clear, although this approach works at the micro level, it continues to have macro-level development ambitions, even as it reconceives them in more dynamic terms: seeking to transform social protection efforts from "safety-net to springboard" (World Bank 2001a). The Social Protection Unit's current website builds on this idea:

In a world filled with risk and potential, social protection systems help individuals and families especially the poor and vulnerable cope with crises and shocks, find jobs, improve productivity, invest in the health and education of their children, and protect the aging population (World Bank 2017).

EVALUATION

For the many experts and officials at international development agencies seeking to re-establish their authority in the wake of the failures of the 1990s, these new development devices are attractive in part because their promise of calculability. Many CCT programs have been explicitly designed to collect evidence about their effectiveness, and their growing popularity among development agencies is linked to the promise of demonstrating measurable results. After inconclusive evidence about whether it was the cash or the conditions in CCTs that had some positive effects on school enrollment, a growing number of CCT programs have been designed as randomized experiments that test the effectiveness of conditional and unconditional payments (Baird et al. 2010).

In the case of microcredit, calculability plays a very different but nonetheless crucial role: the development of increasingly sophisticated techniques for evaluating and pricing credit risk among the very poor has made it possible for large financial firms to become involved, not only expanding microcredit but also building a new financial industry around the packaging and resale of these loans to foreign investors (Langevin 2017). These firms have managed in some cases to securitize large portfolios of microloans (rather like the subprime mortgages at the heart of the last global financial crisis), translating the often very high interest rates charged to poor borrowers into global flows of investor value (Aitken 2013).

GOVERNING FAILURE

Although these various new development devices hold the promise of measurable results, we should not

overestimate their technical proficiency; they continue to face the problem of failure even as they seek to respond to it. In fact, many of these new development initiatives have failed to meet at least some of their main objectives. The evidence on conditional cash transfers, though plentiful, is mixed: they do seem to have positive short-term effects on educational enrollment in particular, but their longer-term effects are difficult to demonstrate, and it is not clear yet whether the conditions themselves make any difference. There have also been some highly publicized failures in microcredit, including a rash of suicides by individuals crushed by microfinance debts in Andhra Pradesh, India, that have reinforced a broader questioning of its capacity to alleviate poverty.

More fundamentally, the tension that I identify at the outset of this article—between a growing recognition of the messiness of development success and a persistent desire to tame and often deny that complexity by simplifying forms of measurement and evaluation—remains itself a nagging source of failure. Many of the development practitioners I have spoken to are well aware that it is nearly impossible to make tidy causal links between a given policy action and a complex series of longer-term outcomes, particularly where there are multiple other aid actors and external dynamics in play. Yet, because they are forced to play the game of measurable results, they have begun to design their policies so that they are as easy to measure as possible, distorting development objectives to make them appear calculable (Natsios 2010).

This emergent micro approach to development assistance remains a paradoxical one: cultivating public goals by mobilizing private interests, pursuing more complex objectives while trying to translate them into simpler metrics, and ultimately courting repeated failure to give the veneer of success. ■

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BIBLIOGRAPHY

Aitken, R. 2013. "The Financialization of Micro-Credit." *Development and Change* 44(3):473–499.

Baird, S., C. McIntosh, and B. Ösler. 2010. "Cash or Condition? Evidence from a Randomized Cash Transfer Program." World Bank Policy Research Working Paper 5259.

Barry, A. 2012. "Political Situations: Knowledge Controversies in Transnational Governance." *Critical Policy Studies* 6(3):324–336.

Best, J. 2013. "Redefining Poverty as Risk and Vulnerability: Shifting Strategies of Liberal Economic Governance." *Third World Quarterly* 34(2):109–129.

———. 2014a. "The 'Demand' Side of Good Governance: The Return of the Public in World Bank Policy." In *The Return of the Public in Global Governance*, edited by J. Best and A. Gheciu, pp. 97–119. Cambridge, UK: Cambridge University Press.

———. 2014b. *Governing Failure: Provisional Expertise and the Transformation of Global Development Finance.* Cambridge, UK: Cambridge University Press.

Boughton, J. M. 2003. "Who's in Charge? Ownership and Conditionality in IMF-Supported Programs." IMF Working Paper WP/03/191.

Collier, P. 1997. "The Failure of Conditionality." *Perspectives on Aid and Development*, edited by C. Gwyn and J. Nelson, pp. 51–77. Washington, DC: Overseas Development Council.

Killick, T. 1997. "Principals, Agents and the Failings of Conditionality." *Journal of International Development* 9(4):483–494.

Langevin, M. 2017. "L'agencement entre la haute finance et l'univers du développement: des conséquences multiples pour la formation des marchés (micro)financiers." *Canadian Journal of Development* .

Natsios, A. 2010. *The Clash of the Counter-Bureaucracy and Development.* Washington, DC: Center for Global Development.

Operation Evaluation Department, World Bank (OED). 1994. *Annual Review of Evaluation Results 1993.* Washington, DC: Operation Evaluation Department, World Bank.

Stiglitz, J. 1998. *Towards a New Paradigm for Development: Strategies, Policies, and Processes.* Prebisch Lecture. Geneva, Switzerland: United Nations Conference on Trade and Development.

World Bank. 1997. *World Development Report 1997: The State in a Changing World.* Washington, DC,: World Bank.

———. 1998. *Assessing Aid: What Works, What Doesn't, and Why.* New York: Oxford University Press.

———. 2001a. *Social Protection Sector Strategy: From Safety Net to Springboard.* Washington, DC: World Bank.

———. 2001b. *World Development Report 2000/01: Attacking Poverty.* Washington, DC: World Bank.

———. 2017. "Social Protection: Overview." http://www.worldbank.org/en/topic/socialprotection/overview