



# SLIPPING THROUGH THE NET

Cambodia's border war against drug-resistant malaria

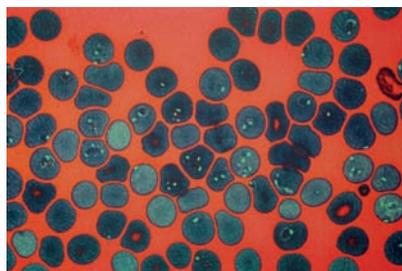
By Matthew Power

The provincial health clinic in Pailin, Cambodia, is a single-story concrete structure with peeling white paint covering the exterior and a red cross hanging above the entrance. The walls are hung with sun-faded malaria-education posters written in Khmer script. One illustrates a nighttime scene in a jungle hut: a mother and child sleeping peacefully beneath a net as oversize mosquitoes drop to the floor in death spirals. I am standing with a group of Cambodian doctors and nurses in stained white lab coats, and we form a semicircle around a young man slumped in a plastic chair, arms crossed and skin glossy with fever sweat. He is Chheang Ayn, a twenty-eight-year-old migrant farmworker who has come to the clinic from his village on the Thai border. A doctor shows me the results of a rapid diagnostic test. The man is infected with *Plasmodium falciparum*, the parasite that causes the deadliest strain of malaria. Chheang's face is flushed and exhausted, but he smiles weakly and trades jokes with the doctors. He's made it to the right place: the parasites in his bloodstream are about to be fought with the best medicines available to modern science.

The shape-shifting eukaryotes of the genus *Plasmodium* have been borne from host to host by the mos-

Matthew Power is a contributing editor of Harper's Magazine. His last article for the magazine, "Ghosts of Wounded Knee," appeared in the December 2009 issue.

quito genus *Anopheles* since long before there were humans to infect. Mosquitoes have been recovered from glowing lumps of amber, their fossilized guts carrying *Plasmodium* 30 million years old. For the past 500,000 years, the parasite has mutated within us, and we have evolved in response.



The disease's name is a record of our failure to understand it: *malaria*, the "bad air" of pestilential fens and miasmatic swamps. The parasite's fevers have burned their way through our history: halting the French canal diggers in Panama's swamps and Atilla the Hun at the marshy outskirts of Rome, bearing off Alexander the Great and Genghis Khan, Byron and Dante, along with nameless millions.

Here is how it kills: the parasite enters the blood through the slicing mouthparts and saliva of the *Anopheles* mosquito. It finds its way to the liver, where for a week or a month it divides asexually. Eventually, the swarm of parasites empties into the bloodstream, where they colonize red blood cells and

burst them from within. Then come waves of fever followed by ebb tides of chills. The infected blood cells clump together and stick to vessel walls to avoid being drawn into the blood's filters. Capillaries clog and hemorrhage; the whites of the eyes turn yellow, the fingernails white, the blood itself pale orange. Anemia, vomiting, and cramps follow. The spleen fills with destroyed blood cells and nearly doubles in size. In the great majority of cases, symptoms clear with treatment, or the victim recovers on his own, the disease little worse than a bad case of the flu. But in severe cases, especially in pregnant women and young children, the parasite overwhelms the host. The blood-brain barrier is breached, and cerebral malaria ensues: coma, organ failure, and death can occur within hours. The death of the host is of little evolutionary cost to the parasite. In the fever-wrack, or the weeks of dormancy, a single *Anopheles* mosquito lands, gorges itself on parasite-laden blood, and then flies away. A week later it feeds again, the *falciparum* in its gut is transferred to a new host, and the cycle begins anew.

The parasite that's attacking Chheang Ayn won't have a chance to induce a severe case. At the clinic he will be kept a few days for observation and given a heavy course of an artemisinin combination therapy, or ACT. In a week he should be back to normal.

The landscape around the clinic in Pailin is raw and red, wide rolling



fields of rough-tilled clay punctured by high limestone outcrops. It is August, monsoon season, and brilliant green undergrowth crowds the roadsides. A few giant trees stand among the fields of corn stubble, their flying-buttress roots and high branches all that remains of the rainforest that until recently covered the region north of the Cardamom Mountains along the Thai border. This is a remote and rural territory, still strewn with thousands of land mines, a legacy of its years as a Khmer Rouge stronghold and battleground. The last remnants of the regime held on here until 1997, almost twenty years after being driven from the rest of the country. They funded their ongoing struggle by exploiting a web of smuggling routes, stripping the area of its timber, and mining gemstones—from what was once among the richest deposits of sapphires and rubies in the world. Even today, former Khmer Rouge members hold much of the political power in Pailin; they build garish mansions on the edge of town, while a shifting population of migrant plantation workers, itinerant gem miners, and cross-border smugglers occupy the region. Goods and people

drift back and forth across the porous border every day.

Pailin's market occupies a large, dusty lot near the town center. A man honks his way through the crowd on a motorcycle loaded with a hundred live chickens dangling upside down from a bamboo frame. Teenage farmworkers from the countryside haggle over piles of skinny jeans, gold lamé disco shirts, flip-flops, and trucker hats, the latest offerings from Phnom Penh's garment industry. Transactions are conducted in Cambodian riels, Thai baht, and—most frequently—stacks of filthy U.S. one-dollar bills, worn soft as old denim. Several gem dealers, magnifiers tilted back on their heads, sit drinking iced coffee at a massive table, six feet across and six inches thick, made from a single blood-red slab of *beng*, an endangered rainforest hardwood. Their wares are spread before them on scraps of chamois: ruby rings, sapphire pendants, garnet earrings. In the shadows behind them, two boys work intently on grinding wheels, cutting and polishing tiny garnets the color of root beer. One dealer dumps a bag of small rough sapphires in front of me, and the stones skitter across the

table. I pick a pea-size sapphire up and hold it to the light, peering into its undersea glow and trying not to let on that I couldn't tell it from beach glass.

This Cambodian outpost has become the center of a health crisis that could threaten the vast and complex architecture of twenty-first-century malaria policy, rendering wasted billions of dollars and threatening millions of lives. In December 2008, a team of Austrian, American, and Cambodian researchers published a letter in the *New England Journal of Medicine* detailing an unsettling finding. The headline read: "Evidence of Artemisinin-Resistant Malaria in Western Cambodia." Artemisinin is a derivative of *Artemisia annua*, or sweet wormwood, a fernlike herb that grows wild across Asia. The plant's utility as a treatment for fever—and hemorrhoids—was noted in ancient Chinese medical texts, but its extraordinary antimalarial properties were not discovered until Chinese researchers isolated the active compound in the early 1970s. Today it is an irreplaceable component of the combination therapies—artemisinin paired with another antimalarial drug, such as lumefantrine, mefloquine, or



piperazine—that have been hailed as a “magic bullet” against malaria. Over the past decade, global malaria rates have come down 26 percent. The *NEJM* letter described a study conducted on sixty malaria patients in Cambodia’s Battambang province, an area that includes Pailin. Artemisinin therapy took far longer than usual to clear their blood of parasites. Two cases proved entirely resistant to the drug. “Before this, I was skeptical. I thought resistance was not possible,” says Dr. Harald Noedl of the Medical University of Vienna, the lead author of the study. “If we lose artemisinin, we lose malaria treatment.” New drugs are being developed, but these are years away from being viable.

The Cambodian-Thai border is a region infamous among malariologists as a wellspring of drug resistance; the global failures of key antimalarials like chloroquine, sulfadoxine, and pyrimethamine in the 1970s have each been traced back to western Cambodia. Host by host, resistant parasites hopped to Myanmar, migrated across northern India, and reached at last the great parasite pool of sub-Saharan Africa, where 90 percent of the world’s malaria cases

occur. The great fear, echoed by public-health experts from Bangkok to Geneva to Washington, is that the artemisinin-resistant strain of *Plasmodium falciparum* in western Cambodia could cross the Thai border and eventually spread throughout the world, setting back the global effort by decades. Considering the implications, even the constitutionally dispassionate journals *Nature* and *The Lancet* used terms like “disaster” and “catastrophe.” Dr. Arata Kochi, a former WHO malaria chief, claimed that if we lose artemisinin, “basically, we’re dead.”

The news from Cambodia was a serious blow to the Bill and Melinda Gates Foundation, which in 2007 had announced an audacious multi-billion-dollar initiative: to wipe malaria from the face of the earth. The Gateses control the purse strings of the largest private foundation in the world, spending \$3.4 billion last year on education, health care, and poverty reduction. In October 2007, speaking in Seattle to a forum of three hundred epidemiologists, immunologists, health ministers, pharmaceutical executives, directors of nonprofits, and heads of international agencies, the couple laid out a multi-pronged

plan of attack. Eradication has only ever succeeded with smallpox and the obscure cattle virus rinderpest, and to achieve it with malaria would require unflagging political will and a colossal amount of money. The timeline was anyone’s guess, but Bill Gates promised “a lifetime commitment.”

After decades in obscurity—global funding bottomed out in the 1990s at less than \$100 million annually—fighting malaria, as the *New York Times* put it, has become “a hip way to show you care.” The Gates Foundation’s pledge represents the vanguard of a vast effort taken up over the past ten years, ranging from huge new public-private entities like the Global Fund and Roll Back Malaria to celebrity appeals on *American Idol*. When George Clooney returned from Sudan infected with the disease, the media coverage made it seem downright glamorous. Led by the Gates Foundation, malaria funding has increased by a factor of twenty in the past decade. And in the grant-hungry world of public health, doubting the stated goal of so powerful a funder is out of the question.



After the news of artemisinin's failure broke, the Gates Foundation made an emergency disbursement of \$22 million to the World Health Organization for a two-year malaria-containment project in western Cambodia. The project would attempt to isolate and wipe out the drug-resistant parasite for good. The containment zone stretched along the border with Thailand, encompassing 270,000 people in more than a hundred villages and spanning an area roughly the size of Connecticut. Bill Gates would doubtless argue that if containment worked it would seem like a bargain; he needed to protect his enormous investment in fighting malaria around the world. But was containment possible in a place as chaotic as the Cambodian-Thai border? That was the question that led me to Pailin, where I hoped to see how the war on malaria was being prosecuted and to assess the chances that it could ever be won.

**A**t an outdoor restaurant in Pailin I meet the man in charge of

outwitting the drug-resistant *Plasmodium*, Dr. Najibullah Habib—Najib for short. He was born in Kandahar, raised in Manila, educated in London, and is now a WHO staffer based in Phnom Penh. Najib is voluble and cheerful, a boyish forty-two-year-old with wavy brown hair and a loud laugh. In the past two years his containment project has distributed more than half a million insecticide-treated bed nets in Cambodia. “There were warehouses full of bed nets,” Najib tells me. “We didn’t know where to put them. People were crawling over bed nets to reach their desks.” Nearly a thousand village malaria workers, or VMWs, have been recruited and trained. Paid \$15 a month, they form the front line in monitoring the population, testing sick people, and distributing medication. Cambodia lacks what in development-speak is called “absorptive capacity”: no matter how much money is thrown at a project, there still need to be enough skilled people available to make it work. “Cambodians were not seen as effective people to implement a tough,

complicated program,” says Najib. “But they did.” The containment project is in the midst of screening thousands of villagers in the areas where malaria was most common the season before.

Najib tells me many times how important statistics are to controlling the spread of drug resistance. “You have to know what you are talking about,” he says. “That explains our obsession with surveillance, data, information flows, trying to quantify the people.” Good numbers are also important to justify funding to results-obsessed philanthropists. The work can continue only as long as the money is there. For the moment, this is not a problem. Before artemisinin resistance was discovered, Cambodia’s national malaria budget was about \$2 million a year. The Gates money dwarfed this amount, and the Global Fund has pledged more still.

To the extent Najib can measure success so far, things seem to be working. By this point the previous year there were 1,210 cases of *falciparum* malaria; Najib has found only



512 new cases since the containment project began. “This project was an emergency effort—we had to do it very quickly,” says Najib. “We’re happy that it’s actually showing results.” But the rainy season has just begun, and with it will come a surge in the mosquito population, and with that many more opportunities for the disease to spread.

**T**o see the containment plan in action, Najib and I join a drug inspector named Nuth Tith on his morning rounds. Tith is one of a phalanx of inspectors visiting pharmacies throughout the region to search for fake or ineffectual malaria medication. He is especially concerned with stopping “monotherapy”: the sale of artemisinin without its partner drugs, a practice that greatly increases the chances of resistance evolving.

Tith—compact, middle-aged, with large glasses and the strict demeanor of a schoolteacher—is dapper in his inspector’s uniform: high waist, epaulets, and a sky-blue peaked cap with an enormous golden crest. Like many government employees in the region, he is

a former member of the Khmer Rouge. We pile into a shiny white Toyota Land Cruiser—the official vehicle of NGO-land—which bears the emblem of the World Health Organization. Following us is a convoy of several matching SUVs, carrying doctors and officials from the British nonprofit Malaria Consortium and the National Malaria Center. The logo for the latter is a giant blood-engorged mosquito inserting its proboscis into a map of Cambodia. It occurs to me that by pulling up in a convoy of white aid vehicles, filled with government health officials, foreign aid workers, and a journalist, we may be forgoing the element of surprise.

We come to a long row of drug stores at the edge of the market. At the first shop, a blue cross hangs from an awning and a glass case displays sun-bleached boxes of medicines. Tith smiles and chats with the proprietor, an older woman who opens up a ledger for his perusal, and he strolls around the shop glancing into the cases piled high with antibiotics, painkillers, and other prescription drugs. Tith finds nothing amiss while the group of doctors and officials stands there watching him. There are shops

like these in every village, Najib tells me, mainly purchasing their supplies from traveling drug sellers. It is an incredibly difficult system to police in a country like Cambodia, where market pressures combine with high levels of government corruption to hinder enforcement. Tith, however, looks incorruptibly serious—a ramrod-straight and unsmiling martinet—as he conducts his duties.

Throughout the drug shops, it is clear that the inspector is a familiar presence, and Tith goes through the same routine at each, the sellers showing their wares and opening their books, the inspector checking dutifully that the drugs are aboveboard. But it is also clear that this system has its limits. “To see the real situation in drug stores, you need a ‘mystery client,’” says Najib, meaning someone who can go incognito and try to purchase black-market malaria drugs. Still, perhaps the mere presence of an inspector is enough to scare the shopkeepers straight, at least in Pailin. Although the Gateses, the WHO, and aid groups spend millions providing high-quality antimalarials to the population at an extremely low subsidized cost, because of theft, cor-

ruption, and poor distribution there is never enough available to meet the demand. Najib estimates that two thirds of the antimalarial drugs in Cambodia are purchased through what he calls “a very robust private sector.” That can mean anything from local shops like these to rolling apothecaries on the backs of motorcycles, supplying the most remote communities, their business conducted completely outside the purview of health authorities.

The problem of fake antimalarials has been widespread in Asia for more than a decade. In 2006, investigators from the WHO and Interpol tested 391 samples of artemisinin-based antimalarials gathered from across Southeast Asia. Operation Jupiter, as it was called, found that half the samples were fakes. Some pills contained acetaminophen or the useless antimalarial chloroquine. Others contained toxic precursors of the club drug ecstasy, suggesting that the manufacturers thought fake antimalarials might have a comparable profit margin. But perhaps the gravest threat posed by fakes was that many samples actually did contain traces of artemisinin, possibly included to throw off testing. One of the surest ways to breed resistance to a malaria drug is to expose the parasite pool to an insufficient dose, creating what is known as “drug pressure.” The WHO learned this in the 1960s, when its disastrous program of adding chloroquine to table salt ushered in the drug’s failure worldwide.

We come to a stall with piles of bed nets for sale, and Najib turns them over in his hands, sunglasses tilted back on his head, collar spread in the heat, appraising them like a bargain hunter. He is glad to see that none are from his program, and jokes about the petty ironies of his very serious job. A treated bed net costs two days’ salary for a typical Cambodian, so in the early days of the containment project Najib had to watch closely for “leakage,” the development community’s euphemism for theft. A few stray nets were spotted in a market in Battambang. Despite the efforts of the project to give out half a million nets for free, there is still an active market for them. But the desirability of the nets doesn’t necessarily translate into disease prevention. Najib says some people don’t like the stiff material

and small size of the WHO-provided nets; others feel stifled sleeping under nets in the humid air. In some places, bed nets have been repurposed as fishing nets and frog pens. “You can’t just stand on street corners and hand out nets willy-nilly and say, ‘Oh, we’re doing a good job,’” he tells me.

We make our way back to our vehicles through the throat-clogging air of the meat market, where catfish lie on blocks of ice and live eels roil in buckets. Unidentifiable bush meat sits next to bloody mounds of offal, exenterated chickens revealing embryonic eggs. Broad trays offer spiced and deep-fried regional delicacies, for sale by the kilo: frogs, crickets, grasshoppers, water bugs, mealworms, tarantulas. The floor is swarming with two-inch cockroaches, their antennae whipping robotically. Then I realize they are everywhere, even dropping down from the canvas tarp overhead. One falls straight down the back of my collar and skitters between my shoulder blades as I dance around frantically trying to shake the thing out. I feel a hand dart up my shirt, and with a quick pinch the cockroach is plucked off my bare skin. Tith, the nattily uniformed drug inspector, flicks it away casually as he gives me an apologetic smile. The shopkeepers explode into laughter.

The following day I travel out of Pailin along a deeply rutted red dirt road with Najib and Dr. Andrew Thomson, a lanky, salt-and-pepper-haired New Zealander who is a field officer for the WHO containment project. We are seeking out the most at-risk population on the border, migrant plantation workers. We drive past grass-thatched huts, half-naked Khmer children harrying chickens in muddy courtyards. “This is *classic* malaria country,” Najib tells me. We swerve sharply to dodge a man on a mud-spattered motorcycle coming the other way, a cigarette dangling from his mouth, a trio of pigs crammed in a rattan basket on the seat behind him. A certain casualness about danger seems to be a legacy of the war: a few weeks earlier a drunken farmer and three friends were killed when the rocket-propelled grenade he was using as a mock karaoke microphone exploded.

Thomson and Najib are good friends, fellow citizens of a humanitarian-aid elite spread across the world’s least fortunate places: Kabul, Kigali, Port-au-Prince, Phnom Penh. I spot another white SUV parked at the roadside, this one bearing the mark of the HALO Trust, a land-mine-eradication nonprofit, and remark that the only vehicles on the road seem to belong to nongovernmental organizations. Thomson laughs. “There are *two thousand* NGOs in Phnom Penh. It’s ridiculous. Any Tom, Dick, and Harry can start an NGO. They’ll never leave. Once a problem is solved they’ll just adjust their mandate and change their reason for being here.” Part of the stated philosophy of humanitarian aid is to get a recipient to a point at which outside assistance becomes unnecessary. But with organizations, as with organisms, acquiescing to one’s obsolescence is not instinctual.

I ask Thomson why an NGO boom happened here. “History merits it. In 1979 there were two million people dead. The country was on its knees. The entire intellectual class was wiped out. Cambodians aren’t going to say no to anyone offering help.” That open-door policy has lasted through to the present, even as in recent years the Cambodian economy has expanded by as much as 10 percent annually and the *Lonely Planet* hordes have descended on cultural sites like Angkor Wat. “Voluntourism”—from building homes to teaching street kids—has grown, as NGOs have tapped the rich vein of Westerners willing to pay for a meaningful and rewarding vacation experience. Our driver points out the low mountains of the Cardamom Range in the haze to the south, where the Maddox Jolie-Pitt Foundation, named for the Cambodian orphan adopted by Angelina Jolie and Brad Pitt, funds game wardens and wildlife monitoring in a 160,000-acre forest preserve. Brangelina, perhaps more than any other entity, has given Cambodia its current air of humanitarian chic.

We pull the trucks up to a small cluster of wooden huts on stilts. There is a pit mine behind a row of trees, and our drivers are drawn irresistibly toward it. They kick about in the gravel, hoping

for a stray garnet, or perhaps an overlooked sapphire the size of a duck egg. Chickens scratch in the dust around an enormous bowl-shaped cistern, and I peer over the edge. A small fish darts into the shadows—an ancient tool, Najib tells me, to keep the water supply free of mosquito larvae.

One of the drivers tells us that in 1985 he fought as a government soldier against the remnants of the Khmer Rouge in this very place. The forest was so thick then you could not see the sun, he says, and there were many, many mines. A man sitting in the shade of a palm stands and strikes up a conversation with the driver. He, too, was here then, positioned on the opposite side of the valley, as a Khmer Rouge cadre. The two men talk animatedly in Khmer, laughing and gesturing toward different landmarks.

On the hillside above us, a family of field workers pick their way among the broken red clods. They are a migrant family from near Battambang, working the planting season for \$2.50 a day each. Eighty percent of Cambodia's population still relies on subsistence farming, and since the Khmer Rouge left the area around Pailin in 1997, the population has grown sevenfold, as tenant farmers rushed to clear rainforest for cassava and corn. A young girl, her head wrapped in a scarf, carries a torch to burn out the stubble of last season's crop, while the rest of her family follows, stooping to drop kernels of seed corn, dyed fluorescent pink with fungicide, into the smoking furrows. Kun Sok Kheut, her fifty-eight-year-old grandmother, squats on a rock as we speak. Of course they know about malaria, she tells us; they sleep together under a bed net. They also offer rice to the spirits and pray that they won't get ill. It is a common duality, a nod to both science and tradition. "Mostly the people believe that spirits control malaria," Dr. Kheang Soy Ty, a USAID malaria-control expert traveling with our caravan, tells me. "Some of the beliefs slow down transmission. Some of them make it worse."

In an open-air shop back by the roadside, an educational poster shows a family sleeping under a bed net with a stack of money floating in the air beside them. It is a clever appeal to self-interest and a blunt illustration of a

self-reinforcing fact: malaria is both an effect and a cause of poverty.<sup>1</sup> The economic burden of malaria, whether from lost productivity or added health costs, is difficult to isolate amid the myriad public-health issues of the developing world. The Columbia economist Jeffrey Sachs, a key theoretical influence on the Gates Foundation's statistic-centric health philanthropy, calculated that over the long term, per-capita GNP of a malarial country would be less than half that of a comparable country without malaria. That estimate trickles down to the Cambodian tenant farmer as a clear advertisement: Use a bed net and you will prosper.

At another farmstead farther along the road, we walk into a field to speak to a group of a dozen planters who are working their way down the furrows by the forest's edge. Mostly young men, wearing trucker hats, ragged shorts, and flip-flops, with the shockingly lean muscle tone that results from back-breaking labor exchanged for just enough sustenance to do it again the next day, they have traveled from the eastern provinces for seasonal work. Because they are constantly on the move, none of them received mosquito nets when they were distributed the previous season. Spending the two or three days' wages required to buy a treated net is simply not in a typical day laborer's financial calculus. The migrants will go without bed nets and accept the risks. Najib has tried to address the issue by distributing stockpiles of nets to local landowners, hoping that they'll provide them for their workers. But even with total net use, there are no guarantees of protection: *Anopheles dirus*, the region's most common vector species, begins to feed at dusk, hours before even the most prudent tuck themselves under their nets.

Migrants thus pose a huge threat to the success of the project. Many come from regions where malaria is rare and so have little natural immunity. The planting season coincides with mosquito season, and migrants

<sup>1</sup> Bill Gates speaks often of the injustice of this cycle: onstage at the 2009 TED conference, in a subversive bit of performance art, he unscrewed a jar filled with mosquitoes. "Let those roam around the auditorium a little bit. There's no reason only poor people should have the experience." The audience roared its approval.



## Panama Fedora

Classic sun protection, hand woven in Ecuador from toquilla fiber. Grosgrain ribbon band, water resistant coating, Reinforced crown measures 4 1/2" tall, the brim is 2 3/4" wide. Finished in USA.

M(7-7 1/8) L(7 1/4-7 3/8) XL(7 1/2-7 3/4) XXL(7 3/4)

#1648 Panama Fedora — \$85



## Stylemaster

The fur felt Stylemaster represents the classic fedora as well today as it would have in the fifties on the streets of Sydney. Made in Australia by Akubra, this durable hat provides style and protection, rain or shine.

4 3/4" crown, 2 1/2" brim.

Sizes: 6 7/8 - 8, Acorn or Carbon Gray.

#1746 Stylemaster — \$145

Add \$9 handling per order.  
Satisfaction guaranteed.

*Visit us online or request a catalog*



Panama Hats from Ecuador  
Northwest Jewelry Designs  
Akubra® Hats from Australia

 **David Morgan**

800-324-4934 davidmorgan.com  
11812 N Creek Pkwy N, Ste 103 • Bothell, WA 98011

often work in areas, like this forest edge, where they push into malaria territory. If infected, they rarely know where to seek treatment and are more likely to buy shoddy medicine on the black market. An *Anopheles* mosquito can travel only six miles in its lifetime, but an infected migrant can transport drug-resistant parasites to wherever the economic winds bear him. There are unknown thousands of such migrants in Cambodia. “We’ve got a denominator issue,” says Thomson. “Trying to figure out how many people live here is almost impossible.” Public health is about reliable numbers; without a baseline, it’s difficult to distinguish victory from defeat.

**T**he next day, Thomson, Najib, and I go to the village of Pich Kiri, which is tucked in a valley among coconut groves and banana trees. A group of latex-gloved village malaria workers are conducting a three-day Focused Screening and Treatment. The village had one of the highest rates of malaria in the region last year, and the screening will help determine whether the bed nets have worked and the disease is being contained. Women line up carrying infants, pulling toddlers behind them. Each offers a finger for a pinprick, and a bright drop of blood is pressed onto a glass slide and a paper tab. A code is written on each palm in ballpoint pen. A small girl wails her lungs out the instant she is stuck. “I could never be a pediatrician,” Najib mutters, wincing at each child’s shrieks. The blood samples will be shipped to a lab in Phnom Penh and analyzed by polymerase chain reaction, or PCR, hundreds of times more accurate than a microscope. The test can detect even asymptomatic malaria from the faintest traces of *Plasmodium* hiding in the body. “PCR has unlocked the whole thing,” says Thomson. But he also knows the technology is too complex to deploy on a mass scale over the long term. “You could make it a military operation, for a one-week period you mobilize the whole of the province, do this for 160,000 people. You could probably find money for it, but the logistics . . .” The idealist and the

pragmatist are at constant war in this line of work, often within the same person.

Rin Tith, a jovial twenty-five-year-old Khmer who speaks excellent English, guides us down a path below the village, gesturing over a fence to a cornfield where a dozen mines were found last year. Thomson warns us to be careful where we step, relating the story of a man who lost his leg to a mine and later stepped on another with his prosthetic. We walk to the edge of a swift and narrow river overhung with branches. Twenty feet away is Thailand, and Tith tells us the men from the village swim over often, day-laboring for half again what they make in Cambodia, loading seventy-kilo bags of corn onto trucks. There’s no economy in this idyllic village; Thailand is a place of boundless opportunity, even for illegal workers. Tith learned his English at a tourist resort down on the coast, but here he can’t even get work at the seedy casinos that have sprung up at the main border crossing. As for malaria, “everybody who lives around here has gotten it. Me, too.” Some people sleep under nets, but they aren’t big enough to fit a whole family. Tith shrugs and smiles broadly, as if to imply there are more important things to worry about. A month later, when the test results for Pich Kiri are returned, the tiny village will turn out to have seven cases of *falciparum* malaria out of the 771 people tested, the highest rate of all the screenings. Despite the best efforts of the WHO, the villagers ferry the parasites in their blood across the border every time they seek work.

**F**ighting the *Plasmodium* parasite may be, as Melinda Gates said, “like playing chess against a computer that changes the rules as soon as it starts losing,” but all the human characters in Cambodia’s malaria drama are, in their way, rational actors: gem miners panning, farmers sowing corn, migrants wading across the border toward better opportunities. Historically, economic growth has played at least as central a role in wiping out

malaria as has any public-health campaign; each country that has eradicated the disease within its borders has essentially developed its way out. Huge sections of the American South were malarial swamps before the disease was eliminated from the continental United States. Wetlands are drained, forests are felled, farmers migrate to cities, houses are built with windows. Cambodia lost decades of growth to war, but in recent years it has had one of the fastest-growing economies in the world. Today there are 85,000 cases a year, and ninety-three deaths, but those numbers are shrinking. In another few generations Cambodia may well buy its way out of malaria.<sup>2</sup> It’s an ugly irony that those same forces of growth—changing land use, an unregulated marketplace, porous borders, economic migration—have also created the artemisinin resistance that now threatens the Gates Foundation’s mission of eradication. A mosquito flits its wings in Phnom Penh and it rains in Seattle.

For the Cambodians in the resistance zone, life goes on. On one of my trips around Pailin, I stop on a bridge and see several men hefting large mesh bags from a truck and dropping them into the river. As I get closer, I see that the bags are writhing as they’re dropped in the water. They are filled with thumb-size grasshoppers, thousands of them in a twitching mass. The grasshoppers are collected in fields at night by flashlight, one at a time, and sold in Thailand for a price per kilogram comparable to that of beef. (Najib says that these men are, predictably, a high-risk group for contracting malaria.) The men have brought the grasshoppers to the river to drown them. One bag splits open into the swirling waters of the stream. There is an explosion of hundreds of grasshoppers, floating and flitting toward freedom, and the men splash frantically in the water trying to gather their harvest back up.

Farther down the river there is a

<sup>2</sup>Even if Cambodia can eliminate the resistant strain of the disease, there are other places that might not be so lucky. In the past few years there have been reports of possible artemisinin resistance in Vietnam, on the Chinese-Burmese border, and on the Thai-Burmese border.

deep pool, and four heads poke out from the muddy water. They are local Khmer men, skin dark and creased. I pick my way across the riverbed, keeping an eye out for the land mines that can be washed downstream during floods. One of the men squats, scooping river mud from a bucket into a wide and shallow pan. He tosses the clay away in chunks, adding river water and rocking the pan until there remains just a clean, uniform till of pebbles at the bottom. He examines the pan minutely and shakes again, his face inches away. Occasionally he will pause, pick something up, and drop it into a small bottle that hangs by a string around his neck. But most often the pan reveals only a handful of dull gravel, which he flings aside to begin again.

Many of the best deposits are long played out, plundered by the Khmer Rouge and then by big Thai mining companies that scoured and sieved the riverbeds with enormous machinery. Now semiprecious zircon, garnet, and tourmaline are more common than sapphire, and even the tailings left by the mining machines have been sifted through by gleaners. I watch the miners for a while, and then I ask one to show me what he's found. He uncorks his small bottle and tips out into his wet palm a pile of tiny rubies and sapphires. They are just flakes of stone, but glistening in the sunshine they possess a near-hypnotic pull. The man seems quite happy to sell them all to me for three dollars, before returning to his work, neck-deep in the muddy water, raking his fingers through the alluvium. The men live nearby, sleeping in open-air huts and spending their days working the river deposits for a few dollars' worth of low-grade stones. Sometimes they sleep with bed nets, sometimes they don't; if they get sick they'll buy some medicine. For now, the miners have more immediate concerns than the spread of malaria, or the ambitions of Bill Gates, or the spreadsheets of the WHO. The air is thick with the coming afternoon rains, but the men rarely glance up at the brooding sky, instead staring flatly ahead as they probe the river bottom blindly with their fingertips. The mosquitoes will rise at dusk, and the men will wander home, hoping for better luck tomorrow. ■

# WORLD'S **FASTEST** LOG SPLITTER!

## The **NEW** DR® RapidFire™ Log Splitter

slices through logs in under two seconds—up to six times faster than ordinary log splitters. We've replaced hydraulics with two 74-pound cast iron flywheels that generate massive power. Split the toughest logs with ease... guaranteed!



74232X © 2012 CHP



**Call Today for a FREE DVD & Catalog!**

of new DR® Log Splitters including gas, electric, and 3-point hitch models!

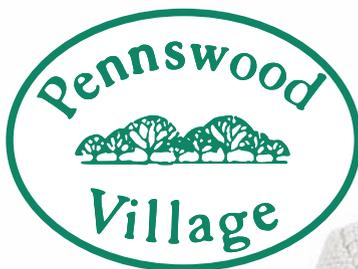
**TOLL FREE 1-877-200-6227**

**www.DRlogsplitters.com**

*“I love my Pennswood apartment and convenient access to NYC.”*

*- Julia Lin, Author*

*A Quaker-directed senior living community*



Newtown, PA 18940

**1-888-454-1122**

**www.pennswood.org**

