

COURIER

Provoking Thought and Encouraging Dialogue on World Affairs

THE STANLEY FOUNDATION | NUMBER 92 | Spring 2018

For Cambodians' Livelihoods, THERE'S A CATCH



INSIDE: Stanleys' Legacy | Natural Carbon Removal | Humans and AI | Cyber Vigilance | Guterres's First Year | ISGLC 2018

Our Heritage, Our Future

By Keith Porter, Editor

In the previous edition of *Courier*, we noted a significant transition at the Stanley Foundation. On November 4, Brian Hanson became our board chair, only the third person to hold that title over our 61-year history. Outgoing Chair Richard H. Stanley (known by all as Dick) had served in that role for 33 years and was named chair emeritus.

Then, on November 17, Dick Stanley died following a brief illness. Our sadness was compounded on December 14 when his wife, Mary Jo Stanley, also passed away. Mary Jo served the foundation for decades as a board member and volunteer. On December 20, Dick and Mary Jo would have celebrated their 64th wedding anniversary.

Last time in *Courier*, I mentioned that our strategic plan includes this core value: We value our heritage and future as a family foundation and nurture sustained family involvement. Dick and Mary Jo lived that value and worked tirelessly to foster family involvement in the foundation. Read more about their work on page 3.

Two pieces in this edition examine the intersection of war and technology. Elsa Kania of the Center for New American Security offers much-needed background on how artificial intelligence is already being integrated into military systems around the world and what it means for efforts to create a more peaceful and secure world. Later, Stanley Foundation staff member Danielle Jablanski interviews *Countdown to Zero Day* author Kim Zetter on the cyber vulnerabilities of the world's most dangerous weapons.

Also in this edition, two alumni of Uncovering Security, a media-skills development program run by the Thomson Reuters Foundation, Stanley Foundation, and Gerda Henkel Stiftung, examine climate change, drought, and development through the lens of Cambodia's Tonlé Sap Lake. Stanley Foundation staff member Francie Williamson explores sustainable agriculture in Clarinda, Iowa. Williamson also introduces us to young people from around the world participating in the Iowa Student Global Leadership Conference.

Finally, Alison Giffen, peacekeeping expert and longtime friend of the foundation, assesses the first year of UN Secretary-General António Guterres and his work to implement long overdue reforms at the United Nations. In her conclusion, I hear echoes of the work Dick and Mary Jo Stanley championed for decades: "Guterres should be applauded for taking on the systemic weaknesses of the world's largest multilateral endeavor, but influential member states will need to take equal responsibility in ensuring its success."



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Cover photo: Cambodians search for fish in the Tonlé Sap Lake in the heart of the country. (Nicolas Axelrod/Ruom photo)



Dick and Mary Jo Stanley

A Legacy of Service

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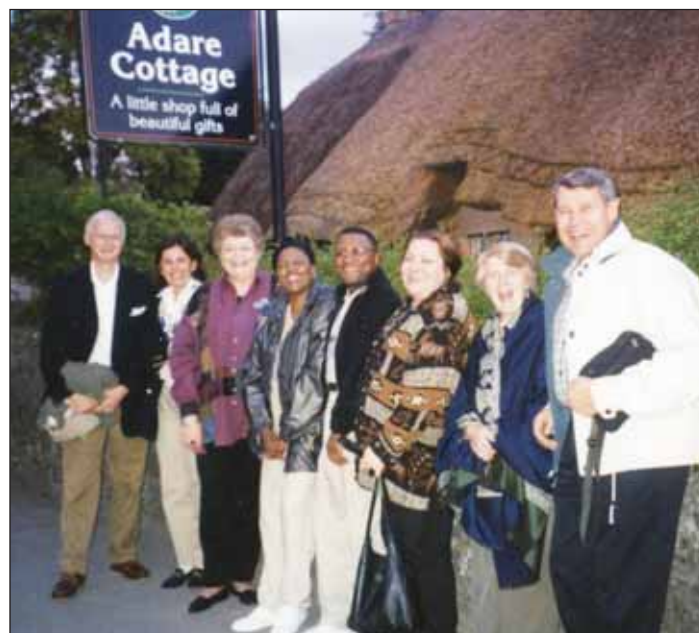
ichard H. Stanley, a founding board member and longtime board chair, and his wife, Mary Jo Stanley, longtime board member and director emerita, passed away within four weeks of each other late last year.

Details of their service to the foundation, the arts, engineering, their hometown of Muscatine, Iowa, and a better world can be found on our Web site.



Over the years, Richard Stanley cultivated close relationships with the UN secretaries-general, (from top) Javier Pérez de Cuellar, who served from 1982 to 1991, Kofi Annan, who served from 1997 to 2006, and Ban Ki-moon, who served from 2007 to 2017.

Words alone, however, are inadequate to express their contributions to the foundation and the joy they found in bringing people from around the world together for serious conversation and genuine fellowship. Here are some scenes from their decades of work leading a family foundation.







When There Are No More Fish

Climate Change, Drought, and Development Have
Devastated Cambodia's Tonlé Sap Lake, Which
Feeds Millions Across Southeast Asia

By Abby Seiff

Photography by Nicolas Axelrod / Ruom

T

alk to a fisherman anywhere in the world and it won't be long before you'll hear the tales: the first catch, the one that got away, the really big one. On the Tonlé Sap Lake, the largest body of freshwater in Southeast Asia, the fish stories are divided into then and now.

The old stories go like this: In 1992, Yem Yun caught a 220-pound Mekong giant catfish. How big was it? So big, his boat nearly collapsed. So big, no one dared to buy it, so Yun cut it up and dried it out and the entire village feasted for a week. Or: When Sok Chetra was young, the fish in the lake were so plentiful they jumped into her boat. Or, even just: Ly Yoeu used to be able to support his family from fishing alone.

The new stories are like this one, shouted from the water by a passing fisherman: "I'm concerned that if there are no fish, I will not eat."

For half of the year, the Tonlé Sap Lake is an elongated figure eight in the heart of Cambodia. At the peak of the six-month dry season, the lake covers about a thousand square miles, its edges demarcated by forests, grasslands,



A floating village on the Tonlé Sap Lake.



paddy fields, and red roads. During the wet season, roughly May to November, all of that disappears: viewed from a satellite, the lake's prodigious floodplains, which can cover 6,000 square miles, make it look as though half the country has vanished below the sea.

The lake operates on a flood-pulse system, like a beating heart, emptied and filled through the arterial Tonlé Sap River, a major tributary of the Mekong River. During the dry season, the eponymous river is pushed toward the Mekong; come rainy season, when monsoons swell the Mekong, the Tonlé Sap reverses course entirely, the only river in the world to do so seasonally. Water rushes toward the lake, spilling into the plains, forests, and paddy fields surrounding it.

With the pulsing water come the fish—billions of them, representing more than 100 species, which migrate from higher reaches of the Mekong down through the Tonlé Sap River and into the lake. Across the globe, only a handful of countries—all many times the size of Cambodia—boast larger inland fisheries. None rely on their lakes to the extent that Cambodia does. The fish, some 500,000 tons of which are caught each year, feed the nation, providing the main source of protein for as much as 80 percent of the population, and they feed Cambodia's neighbors, who import thousands of tons each year as part of a \$2 billion industry.

For as long as there has been documentation of Cambodia, the lake's abundance has been noted. In the early 1300s, a Chinese emissary named Zhou Daguan marveled at what he termed the Freshwater Sea. "There are very many fish whose names I don't know, all of them coming from the Freshwater Sea ... there are giant soft-shell turtles and alligators as big as large pillars ... there are crocodiles as big as boats.... They get clams, mud clams and pond snails just by scooping them out of the Freshwater Sea," he wrote in *A Record of Cambodia: The Land and Its People*. A half-millennium later, in 1872, French explorer Louis de Carne remarked upon the "astonishing harvest of the waters." As recently as a decade or two ago, fishers recount, stocks were so plentiful they could dip a bowl into the water and come up with enough food for dinner.

Those days appear to be gone for good. A trifecta of economic development, illegal fishing, and climate change is changing the ecology of the lake, permanently weakening the pulse system and wiping out fish stocks. All along the Mekong, Chinese-funded hydropower dams are ballooning as the rapid economic growth of the region runs headlong into an electricity shortfall. On the lake, corruption has seen large trawlers continue to ply protected areas, while individual fishermen increasingly take up their own small-scale illegal fishing. A changing climate, meanwhile,



A man sits on his boat loaded with shrimp traps in Kampong Khleang.

has led to devastating droughts in recent years. Few on the lake have much hope for the future generations. “Our children’s grandchildren may not see the fish,” Hon Bunly, a 55-year-old living along the lake, told us.

In May of last year, when the rains had yet to come and a yearlong drought that began in mid-2015 was at its peak, two photographers, a translator, and I spent about a week circumnavigating the lake. We started near the northern tip, in Siem Reap province, home of Angkor Wat, before heading down to Battambang, Pursat, and Kampong Chhnang provinces, a trip of about 300 miles. Everywhere we went, we asked people what type of fish they don’t see anymore: They don’t see Kanchos and they don’t see Kompleang. There’s no Kanchan Chras and there’s no Pkar Ampil. People told us they were still catching fish, but they were smaller and fewer in number, and fishers had scant faith they would be there in the future.

On a searing-hot afternoon, we visited Kampong Khleang village, located about an hour’s drive outside Siem Reap city. For half the year, water drowns the village, rising up to 20 feet. All along the roads, houses are perched on dizzyingly high stilts. In the vast spaces underneath the homes—where residents store nets, traps, motorbikes, and

livestock during the dry season—we chatted with people about the effects of the drought as they repaired shrimp traps or lounged in hammocks.

Chum Kear, a 61-year-old fisherman, and his wife, Kay Oeun, invited us into their home. Outside, far underfoot, children ran shrieking through the hard dirt street. During the wet season, the lake swells so much that it can lap at the door; in particularly rainy years, rooms have flooded. The couple shares the house with the youngest of their 10 children and a few of their 18 grandchildren. “A long time ago, it was so good,” Kear said of the fish harvest. “Now it’s so bad. The big problem is there are no more fish any more. This year, I can’t make money at all and owe money to the bank.”

Unable to catch enough fish, or afford the vegetables, meat, and staples sold by vendors paddling small wooden boats, Kear and Oeun, along with many of their neighbors, were simply eating less.

Like many of the older generation, the family has lived in the same spot on the lake since the fall of the Khmer Rouge in 1979. In the decades after the brutal regime crumbled and its forced agricultural collectives were disbanded, the



A family packs up its boat to move to Vietnam.

population living on the lake rapidly expanded, to more than 1.2 million people today—and more than half of Cambodia's population lives within the floodplains.

But with the pressures mounting, some on the lake felt they had no choice but to leave. After departing the stilted villages in Siem Reap, we moved on to Pursat, where we hired a boat to take us to some of those floating villages. The pilot, Seng Sokum, pointed out empty homes as we floated by. "In each village, families have some members somewhere else," he told us. "Sometimes two or three people." In the evening, we returned to the spectacle of a massive truck being loaded with the boats and all the worldly belongings of an ethnic Vietnamese family. "In 20 years we've never been back [to Vietnam]," the woman told us, in Khmer. "But business is bad here and I can't make enough to eat." By last September, hundreds, if not thousands, of families had made the same move.

"Cambodian people depend on fish in the Tonlé Sap Lake," said Thinny Sothy, the deputy chief of the Fisheries Administration's Siem Reap cantonment. "They eat [141 pounds] of fish a year, including dry fish. Even just in cooking food they use prahok," a pungent, fermented fish paste that is a local staple. "All the people depend on the Tonlé

Sap Lake. Rural families may raise chickens but they sell the chickens to buy prahok."

The United Nations Food and Agriculture Organization has estimated that the annual per capita consumption of fish amounts to 140 pounds a year (though others put that figure closer to 86 pounds), compared to an average global consumption at 44 pounds a year. Near the end of the meeting, Sothy told us he suspects the lake cannot continue in its current state. "I'm also concerned about the lake supporting the people," he said. "Our strategy is to encourage them to do another business while fishing, in order to help families live better."

Until late 2011, vast portions of the Tonlé Sap Lake were divided into fishing lots, a practice that dated back to the French colonial era; in its modern iteration, fishermen paid hundreds of thousands of dollars for a two-year license to all the fish within a given plot, which could span over a hundred square miles. The practice was deeply mismanaged and abused, and every so often, Cambodia's strongman prime minister, Hun Sen, would cancel certain plots, then open them up to the masses as part of a populist campaign. In the lead-up to what would prove a particularly contentious 2013 election, the lots were annulled entirely. Fishermen



Fish are unloaded into a waiting truck to be taken to wholesalers in Phnom Penh.



and researchers alike initially cheered the closure, but the intervening years have been disheartening: Many of the lots were turned into conservation areas, a crucial tool for sustaining fish stocks—but open to the same corruption that routinely damned the prior lot system. Large-scale commercial boats are known to trawl the water deep within the lake. While Sita said that they are occasionally “cracked down” upon by fishery officials in a show of force—particularly this year, in another preelection bid—the problem is far from addressed in full.

Lem Sita, a fish buyer in Kampong Luong, a large floating village in Pursat’s Krakor district, used to own one such lot. “It was good, you could get big fish,” she recalled on a hot, quiet morning. “A few years ago Prime Minister Hun Sen opened up the lots for everyone and there was too much fishing. When the government realized the fish were almost finished, they set them up as fisheries again.” In the course of our conversation, only two small boats arrived to sell fish, each barely a pound. In previous years, Sita said, she processed “many tons each day.” When we spoke to her in 2016, she estimated that she was buying about 220 pounds a day, and her staff of five had been whittled down to two nephews. “My parents worked as fish sellers, but it’s just me now, I am the last one. My kids don’t want to do it,” she said. “All have their own businesses and I want to close up this business.”

Water and Cambodia are inexorably linked. The vast Angkorian cities utilized highly complex water-management systems made up of canals, reservoirs, and hydraulic engineering. Today, the floodplain system brings in the silt and water to grow millions of tons of rice. The pulse system is so vital that one of the biggest holidays on the Cambodian calendar, Water Festival, is dedicated to it. Each November, millions of Cambodians gather for boat races, concerts, and celebrations to mark the end of rainy season and the reversal of the Tonlé Sap.

On the lake and along its tributary rivers, Water Festival also marks the start of fishing season. With winds and rain dying down, and the lake at maximum capacity, the fishing is at its best. Over the next few months, as the lake dips lower and lower, men, women, and children haul in as much as they can—to eat, to pay back last year’s dry season debts, and to purchase the supplies that will take them through the slower months. As it wears on and there are fewer fish to be caught, some people migrate to dry land, where they raise chickens or work as hired farm laborers, among other things. Some stay on the water, catching more seasonally available species like shrimp. Those living near the edge of the lake, in more permanent stilted homes, fish in the waterways leading back toward the lake and take on seasonal work.

The dry season can become hot, even unbearably so, but it remains part of the normal order. Drought is something



Phsar Leu Market in the center of Siem Reap province.

different. In 2016, Southeast Asia faced one of the worst droughts in recorded history. Tens of thousands of acres of crops were destroyed, rivers dried up, and health problems flourished. A massive El Niño that started in the middle of 2015, following a smaller 2014 El Niño, stopped the rainy season early and sent temperatures soaring across the region. In Cambodia, fish exports plummeted 21 percent.

One toll of climate change is extreme weather at either end: higher highs, lower lows. In the coming years, it is expected that both droughts and flooding will worsen. The temperature of the earth in 2016 was higher than had ever been recorded. For the first time ever, forest fires broke out on the Tonlé Sap, damaging hundreds of thousands of acres and killing untold numbers of animals. The fish yield was so bad many fishers gave up trying, falling into deeper and deeper debt that they hoped to offset when the rains came. That same year, the Global Nature Fund deemed the Tonlé Sap to be the “most threatened” lake in the world.

A year after the drought, which ended in June 2016, the impacts of the extreme weather pattern were still being felt on the lake. One of the unexpected things fishermen had reported was that over the past year, the lake had become windy in a way that no one could recall having seen before. With the forest fires and deforestation decimating the normal buffers, wind whipped past unimpeded, making the fishing difficult in an entirely new way.

In March 2017, we returned to one of the floating villages we had visited a year earlier. Kampong Prak is just one of a string of floating villages in Pursat province’s Krakor district, on the southwestern edge of the lake. The night before we visited, an unseasonable storm lashed across the province. It snapped an anchor rope at the home of 71-year-old Mok Hien, forcing his family to stand in the knee-high water for an hour to hold the floating house steady. “The wind is getting stronger and stronger, and I was afraid the house would collapse,” Hien explained.

On top of climate change, hydropower is exacerbating the troubles facing the Tonlé Sap. A string of dams along the main stem and tributaries of the Mekong—some built, some being constructed, and some planned—will lead to plummeting fish stocks, campaigners have long warned. The dams block crucial migration pathways, destroy ecosystems, and lead to siltation upstream and nutrient loss downstream. Decades of advocacy, however, have fallen on deaf ears. Governments along the Mekong insist dams are necessary to supply electricity to growing populations and industries. The costs are steep. One model, carried out by



A woman looks for fish in a leaking boat in Kampong Luong.

a team from Stanford and Princeton universities and several researchers in Cambodia, predicted a 51 percent decline in fish production in the Lower Mekong Basin should all proposed dams go ahead. At the moment, China has seven dams on the Upper Mekong; Laos has three in the works. In total, 11 large main-stem dams are planned in Cambodia, Laos, and Thailand; another 21 are planned in China.

For those living on the lake, such figures translate into stark realities.

“If I were the prime minister, I would not let the dams be built. If there are no dams, the Tonlé Sap’s beauty would be the same as it was 20 years ago. We want a new government because the current administration does not care about poor families, only their families. Cambodians should advocate and demand what they want,” An Socheat, a community leader for the Fisheries Action Coalition Team, a group of nongovernmental organizations that have mobilized local residents to advocate for and protect their waterways, told us. Last year, shortly after the drought, Socheat went to Thailand for a workshop on Mekong dams. “I came back to tell the people in the community: Even though we are far from dams, we are affected. Now they understand we also need to support the people who fight against dams.”

Be it from drought, damming, or overfishing, when the catch drops, fishers grow desperate. Many are increasingly resorting to illegal fishing tactics, like using nets with miniscule holes, fishing during the off-season, or fishing inside of conservation areas, all of which imperils spawn and breeding stocks and further exacerbates the problem.

Sok Chetra, 77, and her husband, Mok Nhor, 78, have lived near the protected wetlands of Prek Toal, at the lake’s northern tip, since they were teenagers—first on a floating



An illegal catch harvested in a protected area in Kampong Luong.

home and later on a stretch of land. Here, the waterways cut through verdant patches of ferns and mangroves, and snowy egrets glide low. All along those waterways are hundreds of fish traps—nets spooled around pieces of wood driven into the soft river floor. Many of these are illegal, made with wood cut from the protected area or with netting whose holes are smaller than the legal limit. “When we install the traps, the fish officials come and move them,” said Nhor. “They say we are illegal,” Chetra added. “But if we cannot do this we will die.”

Across the lake from Siem Reap, in Pursat province’s Krakor district, the conservation area is patrolled by a few dozen fishery officials. The fishery officials’ patrol base is a large floating houseboat located about five miles from the shore. Surrounding it are platforms full of confiscated nets, traps, and the odd powerboat.

When we met the district fisheries chief, Pen Vuthy, on the floating base at the height of the drought in 2016, he told us the amount of illegal fishing had become staggering. “They can’t have enough to support their families. Usually they would get 30 kilos a day, this year they can’t even get

five,” he said. “More and more crime is happening. It’s like if there’s a beautiful daughter in your home—the men want to come inside. Outside they can’t fish, so they run the risk by coming in the protected area, even if they face jail.”

I asked him if people plead for leniency given the circumstance. “Some of them beg me to release [their equipment], but I can’t do it. I need to report it to the commune and district chief and I make them sign a paper saying they won’t come back. Mostly they respect it, we educate them and they don’t come back.”



A collection of confiscated boats and traps in Kampong Luong.



A fishing net being adjusted.

Yem Yun, 43, a fisherman in Prek Toal, spoke openly about the growing pressures on small-scale fishers like himself. The only place to catch big fish, said Yun, is near those conservation area. "Sometimes I put my net in the conservation area, the official takes the net, and I have to pay to get it back," he said. The fine, a bit less than \$4, is a reasonable deterrent, Yun thinks. But the problem is larger than one fisherman. "If it's really a conservation area, I support it, but I'm just concerned officials are corrupt and allow other fishermen to catch," he said. "There's lots of illegal fishing, there's small nets, there's Vietnamese trawlers."

Back in Kampong Khleang, one year after we first arrived, we met 57-year-old Vien Ny, who had lived within a few miles of the village his entire life. "When I was young the water was fresh, blue color," he told us, gesturing toward a muddy inlet coated with trash. This year was an improvement on last, but not by much. In fact, the fish stocks accessible from this area have dropped so much that nearly everyone in this village catches a type of small, cheap, freshwater shrimp now instead. Heaped beneath each home are hundreds of shrimp traps, simple wire-and-net affairs to be strung out en masse during the rainy season. In the dry season, Ny and most of his neighbors take on ad hoc jobs, the odd bit of construction or carrying loads from the port.

Dressed in a fatigue cap, a relic from his former life as a soldier, Ny dragged on a cigarette as he spoke to us about

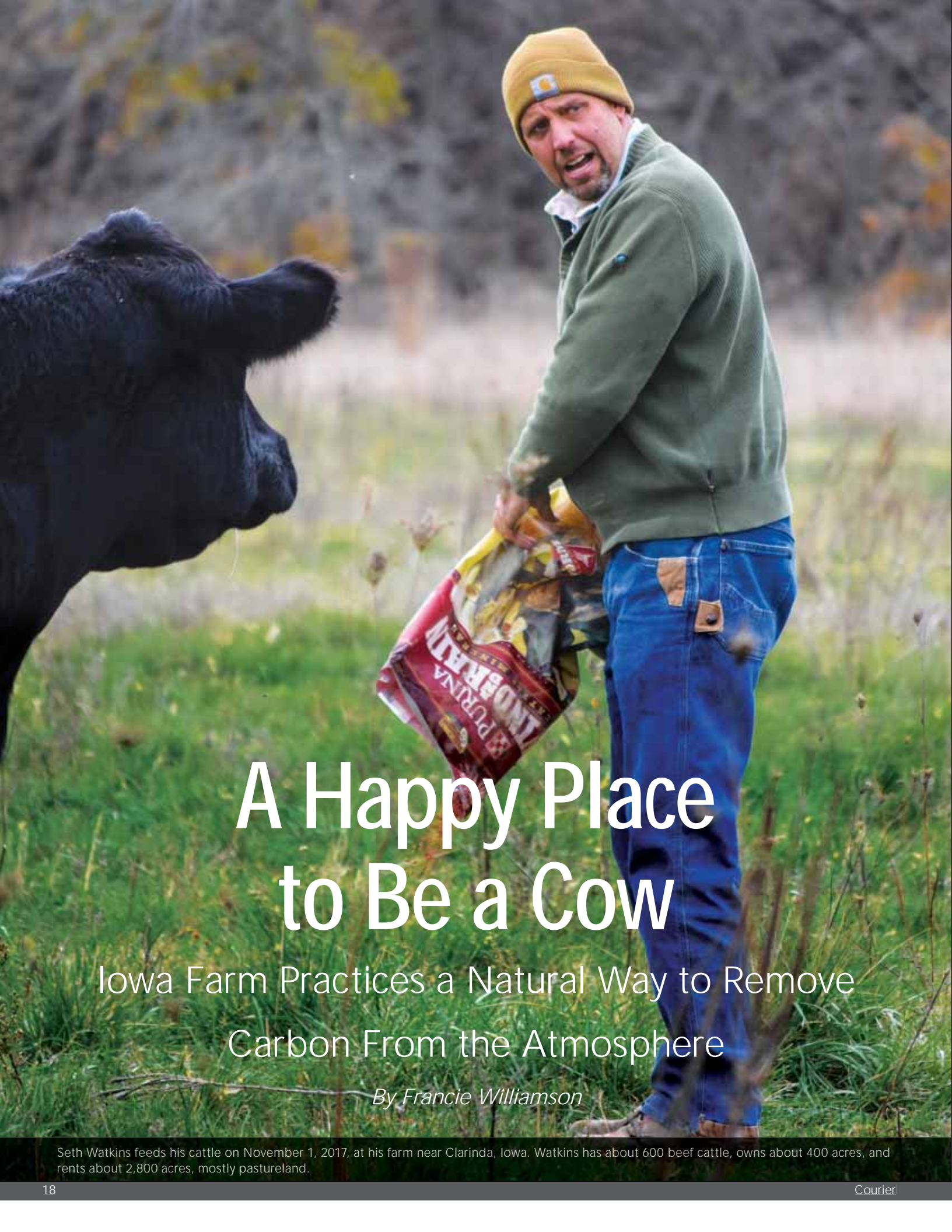
the changes. All around him, his children and grandchildren ran in loops—climbing on and off his motorbike, clambering under his legs. We asked if he'd like them to follow in his footsteps. "I can't predict their future but I think I want them to find other jobs," he said. Catching fish, he explained, was simply the work done by someone with no farmland, no education, and no other option. "When we don't have any job, what else can we do? This is why we are fishermen. If I had knowledge like you do I would do a different job."



Abby Seiff is an award-winning freelance journalist with a decade of experience reporting in Asia.

Nick Axelrod is a filmmaker and multimedia storyteller. He was born in Australia and is currently based in Bangkok, and his work takes him around Asia and across continents, with a focus on climate change and development.

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A Happy Place to Be a Cow

Iowa Farm Practices a Natural Way to Remove
Carbon From the Atmosphere

By Francie Williamson

Seth Watkins feeds his cattle on November 1, 2017, at his farm near Clarinda, Iowa. Watkins has about 600 beef cattle, owns about 400 acres, and rents about 2,800 acres, mostly pastureland.

“H

ello, girls,” Seth Watkins calls, as he jumps out of his dusty white pickup. Black Angus cows and their calves amble across a muddy hill as Watkins calls to them repeatedly. To a layman, it’s hard to tell if the cows are truly happy, but one thing is certain: the animals are living longer and eating a more varied diet than cattle on most Iowa pastures.

Watkins, 49, attributes that to a variety of sustainable agriculture methods he has implemented over the last 20 years at his farm near Clarinda in southwest Iowa after going through a number of “pretty bad weather events.”

“Weather extremes that are just not typical of what we have known the last hundred years,” he says. “And the sad, scary thing is it seems like since the late ‘80s, mid-‘90s, it’s accelerated.

“I just said, ‘Why am I fighting Mother Nature?’” he adds. “I said, ‘You know what, I want happy cows. I want clean water, and I want healthy soil.’ I decided that I wanted to see that and sleep at night instead of feeling like I was doing these other things that didn’t feel right.”

Among the sustainable methods Watkins utilizes are planting strips of native prairie as well as crops such as rye, barley, and clover; fencing ponds; and year-round grazing.

“I’m seeing more resilience in my land, so I’m staying on a more even keel with my production. If we have multiple four-to-six-inch rains in the summer, my soil has held my crops, so I’m gonna be able to harvest a crop. Or if we have an exceptional wet spring or fall, we’ve been able to plant or harvest in a more timely manner just because I do have better soil health than I used to. I think I’m definitely more profitable than when I was farming conventionally.”

The Research Perspective

According to researchers, certain sustainable agricultural practices are a promising natural way to remove carbon from the atmosphere, along with reforestation and land restoration. According to the Intergovernmental Panel on Climate Change, capturing carbon emissions that have already been released into the atmosphere through natural sinks—like in soil or trees or plants—is necessary to reach the temperature targets set out in the Paris Agreement. Further, if we do not take advantage of these natural carbon sinks, we are leaving the door open to depend on risky, unproven carbon-removal technologies in the future. Many of these come with unpalatable side effects like altered weather patterns and the need to dedicate large amounts of arable land to carbon storage rather than food production.

According to the latest research from Jonathan Sanderman, associate scientist at Woods Hole Research Center in Falmouth, Massachusetts, an estimated 133 billion tons of carbon have been lost from the soil to the atmosphere, in large part due to centuries of intensive and unsustainable agriculture practices. But Sanderman says there’s really not just one solution to restore carbon to the soil.

“There’s probably a million prescriptions out there that are most suited to particular soil type, climate, and land use system,” Sanderman says. “I think basically it really boils

down to maximizing the amount of green cover on your land and minimizing the amount of soil disturbance.

“By growing a crop that has deeper roots, you’re putting more carbon in the soil. By putting cover crops in—especially cover crops that you then mulch back into your soil—that’s a lot of carbon that was fixed out of the atmosphere that is being directly put into the soil.”

Matt Liebman, a professor of agronomy and H.A. Wallace Chair of Sustainable Agriculture at Iowa State University in Ames, Iowa, says some parts of the world would do better with cover crops than others because of the length of growing season.

“Cover crops work really well where you have an extended growing season, like in Maryland. They don’t work as well in places with a short growing season like North Central Iowa,” he says.

“In areas where growing seasons aren’t as long, it’s wise to diversify the corn/soybean rotation with small grain crops grown to maturity, like winter wheat, rye, oats, barley, triticale, and include more forage crops that are perennial. They have deep roots and provide continuous living cover, and that can be grass/clover mixtures, or alfalfa.”

The Benefits of Sustainable Agriculture

Watkins drives us to a part of his land that on this midautumn day is still green, as barley sprouts from the ground.

“So if we look over to my neighbor, in the cornfield, that’s all dead and brown. If we look to that one on the hill, that’s all dead and brown. And over here we’ve got something green, which means carbon’s going in,” Watkins says. “It’s great feed, it’s great for the soil, and I’m not starting a tractor right now to feed a bunch of cows, when if you graze all those cows on an acre or two acres you’d be running equipment to feed them right now.”

Watkins says that since he has started using sustainable agriculture methods, he has seen his soil organic levels increase from 1 to 2 percent to between 4 and 6 percent. That means the soil is a lot more fertile.

“Relying on Mother Nature works because farms are living systems, meaning farms are dependent on soil, sunlight, rainfall, and human ingenuity,” he says.

Adding clover to his fields has meant Watkins no longer has to use commercial nitrogen, which can have detrimental effects on the environment and contributes to increased global temperatures.



This pasture on Watkins’ farm was still green in midautumn, thanks to barley sprouting from the ground. In comparison, his neighbor’s cornfield was dead and brown. “We’ve got something green, which means carbon’s going in,” Watkins says.

"We've got some pastures that we haven't used any synthetic product on for over 20 years," Watkins says. "My costs went down because I wasn't buying fertilizer anymore. My conception [rates] went up. And since I improved the quality of my forage with the clover, my productivity also [went up]."

Liebman says he also has seen the need for fertilizers go down when different rotation schemes are implemented. Liebman directs an ongoing experiment of rotations on 25 acres of land at Iowa State University that started in 2002.

"We've looked at the effects of different rotation schemes on agrichemical use, yields, profitability, and environmental impacts, particularly soil quality and water quality," he says. "We found that extended rotations can dramatically reduce the need for synthetic pesticides and fertilizers and petrochemical energy while maintaining or increasing yields and profits and improving the environmental impact of agriculture."

'A Major Challenge'

Sanderman says one drawback of soil carbon sequestration is that it has a limited capacity. That's why other natural carbon sinks, such as forests, which in addition to storing carbon in soil also store large quantities in organic plant matter, are still important to maintain and recover if the world is to achieve the 1.5° Celsius goal set out in the Paris Agreement.

"There's a very finite capacity of a particular soil," Sanderman says. "You can only sequester carbon for, say, 20 to 30 years, and really it depends, but most people say about 20 years and you'll probably stop increasing carbon levels. You'll reach some new plateau."

There is emerging research that indicates storing carbon deeper in soil could increase the carbon storage capacity, but nevertheless, soil has a finite carbon saturation limit. Once soil is saturated, farmers must be encouraged to maintain that carbon through sustainable practices.

That might be why Watkins, after 20 years, has seen his organic levels hover around 5 to 6 percent.

"That sounds about right for Iowa," Sanderman says. "Around 4 to 6, maybe 6 to 8 percent. It depends how deep you measure also."

Sanderman says that the farther north you go, the higher the organic levels will be because cooler environments slow decomposition.



As we walk his land, Watkins pulls up a daikon radish that he planted two months prior on his land. Watkins has implemented several sustainable agriculture practices on his farm in the last 20 years, including planting cover crops and strips of native prairie, fencing ponds, and grazing his cattle year-round.

"In northern Europe, a sign of really good health would probably be 8 to 10 percent carbon in the topsoil."

But restoring the estimated 133 billion tons of carbon already lost from the soil to the atmosphere would require more than even sustainable agriculture can deliver.

"In order to restore that amount of carbon, we would basically have to take all our land out of production, and we're obviously not doing that," Sanderman says. "Most estimates hover somewhere around one billion tons of carbon a year that can be restored by implementing the best conservation management practices everywhere. So about 10 percent or so of our current fossil fuel emissions. It seems reasonable. That number seems to be about the average of a bunch of different analyses."

"Even reaching that level of one billion tons per year requires a massive amount of education, outreach, political incentives. Literally, you have to change the minds of a billion people. There's about a billion people involved in agricultural production around the world, and you have to convince them to change their management system. Seth Watkins is a great example. It's just convincing everyone to do it, enabling people to do it, is definitely a major challenge."

Jason Funk, associate director, land use, at the Center for Carbon Removal in Oakland, California, agrees.

"In order to get the most benefit for the climate, there has to be some pretty transformational changes in what farmers do," Funk says. "Some of the easiest practices that are widely implemented, like no till and cover cropping, those are good things to do. We should try to roll them out as much as we can everywhere, but those only really benefit the climate a little bit, and for no-till in particular, there are some questions about whether or not it actually can sequester carbon. It's true that it certainly does in some places, but we're not sure if it does everywhere."

What's positive, Funk says, is that more and more farmers, like Watkins, are interested in being stewards of the land.

"People are saying, 'Wait a second here, I really feel like I'm being pushed too far down the production front, and really I care about this land,'" Funk says. "'I care about maybe passing it on to my descendants, in a condition I'm proud of.'"

Another positive, Funk says, is that consumers are starting to care more about the origin of their food, how it was produced, and what imprint it left behind on the landscape.

"And they're starting to care more about climate issues," Funk says. "And then there are these differentiated markets opening up for things like organic production or sustainably produced stuff, or regenerative agriculture—that's becoming a word that's being tossed around as something that could become a label or certification down the road."

Toward Carbon Neutrality

Watkins has about 600 beef cattle, owns about 400 acres, and rents about 2,800 acres, mostly pastureland. He says his goal is to ultimately make his farm carbon neutral, which means no net release of carbon dioxide into the atmosphere. To do that, he's looking at adding orchards and bringing in goats to eat plants that cows won't eat so he doesn't have to spray the plants with chemicals.

Liebman says he thinks that's doable, even with the methane output from the cattle.

"There are a lot of ways of soaking up carbon and reducing other kinds of carbon emissions," Liebman says. "I think you really need to look at the major uses of petrochemical energy and associated greenhouse gas emissions in Iowa farm systems, or the use of synthetic fertilizer, principally nitrogen, because it takes high temperature and pressure conditions that are created with natural gas."



Farmer Seth Watkins (right) shows a sample of his soil to Climate Change Program Associate Mark Conway of the Stanley Foundation. Watkins, after implementing sustainable agriculture practices, has seen his soil organic levels hover around 5 to 6 percent, which has helped make his land more resilient to climate change.



Watkins' cattle slowly come to him when he calls. After going through some "pretty bad weather events" in the 1980s and 1990s, he asked himself why he was fighting nature. "I said, 'You know what, I want happy cows. I want clean water, and I want healthy soil.' I decided that I wanted to see that and sleep at night instead of feeling like I was doing these other things that didn't feel right."



Watkins says his goal is to ultimately make his farm carbon neutral, which means no net release of carbon dioxide into the atmosphere. To do that, he's looking at adding orchards and bringing in goats to eat plants that his Black Angus cows won't eat so he doesn't have to spray the plants with chemicals.

"Tillage operations and other tractor-associated machine operations in the field combust diesel and gasoline, and then if you're growing a lot of corn, typically you're drying that grain with natural gas," Liebman adds. "So when you eliminate most of those activities on the farm, much of the combustion of fossil carbon goes away, and Seth is using fertilizer quite judiciously. He's spreading manure from his cattle and using crop rotation as a way to fertilize his fields, so he's using less fertilizer. He's growing less corn because he's got more pasture, and he minimizes his use of machine operations by using no-till and basically farming grass rather than row crops."

Ultimately, Watkins says, he wants to find ecological solutions whenever he can.

"Even if we don't want to admit what the cause of climate change is, we know we're dealing with more-significant weather issues, so we do need to be developing strategies to help with resilience, as far as for planning and harvesting crops," he says.


"Didn't we learn something from the dust bowl? We at least learned that humans can impact climate and things of that nature, and that we can fix it."



The Critical Human Element in the Machine Age of Warfare

By Elsa B. Kania

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In 1983, Stanislav Petrov helped to prevent the accidental outbreak of nuclear war by recognizing that a false alarm in Soviet early warning systems was not a real report of an imminent US attack. In retrospect, it was a remarkable call made under enormous stress, based on a guess and gut instinct. If another officer had been in his place that night—an officer who simply trusted the early warning system—there could have been a very different outcome: worldwide thermonuclear war.

As major militaries progress toward the introduction of artificial intelligence (AI) into intelligence, surveillance, and reconnaissance, and even command systems, Petrov's decision should serve as a potent reminder of the risks of reliance on complex systems in which errors and malfunctions are not only probable, but probably inevitable. Certainly, the use of big data analytics and machine learning can resolve key problems for militaries that are struggling to process a flood of text and numerical data, video, and imagery. The introduction of algorithms to process data at speed and scale could enable a critical advantage in intelligence and command decision-making. Consequently, the US military is seeking to accelerate its integration of big data and machine learning through Project Maven, and the Chinese military is similarly pursuing research and development that leverage these technologies to enable automated data and information fusion, enhance intelligence analysis, and support command decision-making. Russian President Vladimir Putin, meanwhile, has suggested, "Artificial intelligence is the future, not only for Russia, but for all humankind.... Whoever becomes the leader in this sphere will become the ruler of the world."

To date, such military applications of AI have provoked less debate and concern about current capabilities than fears of "killer robots" that do not yet exist. But even though Terminators aren't in the immediate future, the

trend toward greater reliance upon AI systems could nonetheless result in risks of miscalculation caused by technical error. Although Petrov's case illustrates the issue *in extremis*, it also offers a general lesson about the importance of human decision-making in the machine age of warfare.

It is clear that merely having a human notionally "in the loop" is not enough, since the introduction of greater degrees of automation tend to adversely impact human decision-making. In Petrov's situation, another officer may very well have trusted the early warning system and reported an impending US nuclear strike up the chain of command. Only Petrov's willingness to question the system—based on his understanding that an actual US strike would not involve just a few missiles, but a massive fusillade—averted catastrophe that day.

Today, however, the human in question might be considerably less willing to question the machine. The known human tendency toward greater reliance on computer-generated or automated recommendations from intelligent decision-support systems can result in compromised decision-making. This dynamic—known as automation bias or the overreliance on automation that results in complacency—may become more pervasive, as humans accustom themselves to relying more and more upon algorithmic judgment in day-to-day life.

In some cases, the introduction of algorithms could reveal and mitigate human cognitive biases. However, the risks of algorithmic bias have become increasingly apparent. In a societal context, “biased” algorithms have resulted in discrimination; in military applications, the effects could be lethal. In this regard, the use of autonomous weapons necessarily conveys operational risk. Even greater degrees of automation—such as with the introduction of machine learning in systems not directly involved in decisions of lethal force (e.g., early warning and intelligence)—could contribute to a range of risks.

Friendly Fire—and Worse

As multiple militaries have begun to use AI to enhance their capabilities on the battlefield, several deadly mistakes have shown the risks of automation and semi-autonomous systems, even when human operators are notionally in the loop. In 1988, the USS Vincennes shot down an Iranian passenger jet in the Persian Gulf after the ship’s Aegis radar-and-fire-control system incorrectly identified the civilian airplane as a military fighter jet. In this case, the crew responsible for decision-making failed to recognize this inaccuracy in the system—in part because of the complexities of the user interface—and trusted the Aegis targeting system too much to challenge its determination.

Similarly, in 2003, the US Army’s Patriot air defense system, which is highly automated with high levels of complexity, was involved in two incidents of fratricide. In these stances, naïve trust in the system and the lack of adequate preparation for its operators resulted in fatal, unintended engagements.

As the US, Chinese, and other militaries seek to leverage AI to support applications that include early warning, automatic target recognition, intelligence analysis, and command decision-making, it is critical that they learn from such prior errors, close calls, and tragedies. In Petrov’s successful intervention, his intuition and willingness to question the system averted a nuclear war. In the case of the USS Vincennes and the Patriot system, human operators placed too much trust in and relied too heavily on complex, automated systems. It is clear that the mitigation of errors associated with highly automated and autonomous systems requires a greater focus on this human dimension.

There continues, however, to be a lack of clarity about issues of human control of weapons that incorporate AI. Former Secretary of Defense Ash Carter has said that the US military will never pursue “true autonomy,” meaning



Nuclear missiles are displayed September 3, 2015, during a parade in Beijing. As the US, Chinese, and other militaries seek to leverage artificial intelligence to support applications that include early warning, automatic target recognition, intelligence analysis, and command decision-making, it is critical that they learn from earlier errors, close calls, and tragedies. (Xinhua/Pan Xu via Getty Images)



Crew members monitor equipment in the combat information center of the nuclear-powered aircraft carrier USS Abraham Lincoln in the Caribbean Sea. Former Secretary of Defense Ash Carter has said that the US military will never pursue “true autonomy,” meaning humans will always be in charge of lethal force decisions and have mission-level oversight. (Photo by Corbis via Getty Images)

humans will always be in charge of lethal force decisions and have mission-level oversight. Air Force Gen. Paul J. Selva, vice chairman of the Joint Chiefs of Staff, used the phrase “Terminator Conundrum” to describe dilemmas associated with autonomous weapons and has reiterated his support for keeping humans in the loop because he doesn’t “think it’s reasonable to put robots in charge of whether we take a human life.” To date, however, the US military has not established a full, formalized definition of in the loop or of what is necessary for the exercise of appropriate levels of human judgment over use of force that was required in the 2012 Defense Department directive “Autonomy in Weapons Systems.”

The concepts of positive or meaningful human control have started to gain traction as ways to characterize the threshold for giving weapon system operators adequate information to make deliberate, conscious, timely decisions. Beyond the moral and legal dimensions of human control over weapons systems, however, lies the difficult question of whether and under what conditions humans can serve as an effective failsafe in exercising supervisory weapons control, given the reality of automation bias.

When War Is Too Fast for Humans to Keep Up

Moreover, it remains to be seen whether keeping human operators directly involved in decision-making will even be feasible for a number of military missions and functions, and different militaries will likely take divergent approaches to issues of automation and autonomy.

Already, there has been the aforementioned transition to greater degrees of automation in air and missile defense, driven by the inability of humans to react quickly enough to defend against a saturation attack. Similar dynamics may be in play for future cyber operations because of comparable requirements of speed and scale. Looking to the future potential of AI, certain Chinese military thinkers even anticipate the approach of a battlefield “singularity,” at which human cognition could no longer keep pace with the speed of decision and tempo of combat in future warfare. Perhaps inevitably, keeping a human fully in the loop may become a major liability in a number of contexts. The type and degree of human control that is feasible or appropriate in various conditions will remain a critical issue.

Looking forward, it will be necessary to think beyond binary notions of a human in the loop versus full autonomy for an AI-controlled system. Instead, efforts will of necessity shift to the challenges of mitigating risks of unintended engagement or accidental escalation by military machines.

To take advantage
of the potential utility
of AI, human operators
must trust and understand
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but not so much as to
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automated assistance.

Inherently, these issues require a dual focus on the human and technical dimensions of warfare. As militaries incorporate greater degrees of automation into complex systems, it could be necessary to introduce new approaches to training and specialized career tracks for operators. For instance, the Chinese military appears to recognize the importance of strengthening the “levels of thinking and innovation capabilities” of its officers and enlisted personnel, given the greater demands resulting from the introduction of AI-enabled weapons and systems. Those responsible for leveraging autonomous or “intelligent” systems may require a greater degree of technical understanding of the functionality and likely sources of fallibility or dysfunction in the underlying algorithms.

In this context, there is also the critical human challenge of creating an AI-ready culture. To take advantage of the potential utility of AI, human operators must trust and understand the technology enough to use it effectively, but not so

much as to become too reliant upon automated assistance. The decisions made in system design will be a major factor in this regard. For instance, it could be advisable to create redundancies in AI-enabled intelligence, surveillance, and reconnaissance systems such that there are multiple methods to ensure consistency with actual ground truth. Such a safeguard is especially important due to the demonstrated vulnerability of deep neural networks, such as image recognition, to being fooled or spoofed through adversarial examples, a vulnerability that could be deliberately exploited by an opponent. The potential development of counter-AI capabilities that might poison data or take advantage of flaws in algorithms will introduce risks that systems could malfunction in ways that may be unpredictable and difficult to detect.

In cases in which direct human control may prove infeasible, such as cyber operations, technical solutions to unintended engagements may have to be devised in advance. For instance, it may be advisable to create an analogue to circuit breakers that might prevent rapid or uncontrollable escalation beyond expected parameters of operation.

While a ban on AI-enabled military capabilities is likely improbable, and treaties or regulations could be too slow to develop, nations might be able to mitigate likely risks of AI-driven systems to military and strategic stability through a prudent approach that focuses on pragmatic practices and parameters in the design and operation of automated and autonomous systems, including adequate attention to the human element.

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The Global Operations Center is the nerve center for United States Strategic Command, which oversees US Cyber Command. "There are a lot of questions and challenges still to be worked out around the use of offensive cyberweapons. What constitutes an act of digital warfare is one of the most basic," says journalist Kim Zetter. (Photo courtesy of US Strategic Command)

On the Digital Frontlines

The Future of Weapons
Requires Cyber Vigilance

An interview with journalist Kim Zetter, author of Countdown to Zero Day



With no concrete definition of a cyberattack or what might warrant retaliation in response to one, experts say we are only beginning to see the potential for cyberattacks and other exploits to disrupt critical systems and operations. Senior reporter Kim Zetter responds to questions on potential weapons systems vulnerabilities that could present new risks.

The Stanley Foundation is exploring the potential consequences of cyber vulnerabilities and intrusions in nuclear weapons systems. After publishing “Cybersecurity of Nuclear Weapons Systems: Threats, Vulnerabilities, and Consequences” with Chatham House in January 2018, Stanley Foundation Nuclear Policy Program Associate Danielle Jablanski asked Zetter to weigh in on cybersecurity and state and nonstate capabilities.

Zetter spent 13 years reporting for Wired. She has broken numerous stories over the years and has been a frequent guest on TV and radio, including CNN, ABC News, NPR, PBS’s *Frontline* and *NewsHour*, and Public Radio International’s *Marketplace*. She is the author of *Countdown to Zero Day: Stuxnet and the Launch of the World’s First Digital Weapon*, which details the use of a computer worm designed to sabotage Iran’s uranium enrichment program.

Jablanski: You have distinguished yourself as one of the nation’s top security reporters and have been covering cybersecurity, specifically, for quite some time. What is catching your interest now, and are there new challenges or opportunities as a journalist investigating these kinds of stories?

Zetter: What’s interesting now is how predictions after the discovery of Stuxnet are finally proving true. In 2010, when Stuxnet was uncovered and it became known as the first digital attack aimed at causing physical destruction, a lot of people in the industrial control system community

feared it would open the gates to a slew of copycat attacks targeting critical infrastructure. And it surprised everyone when this didn’t occur. But we’re seeing the first stages of such attacks now—with the attack that targeted Ukraine’s power grid in 2015 and 2016 and the more recent attack in Saudi Arabia that targeted a safety system. These attacks are warm-ups that don’t fully exploit what attacks like these are capable of accomplishing but forecast what we’ll see in the future. We can expect that these kinds of assaults will grow in number and sophistication. I also expect that in the near future we’ll begin to see evidence of data integrity attacks—where data is altered in a way that critical systems and information are no longer trustworthy. This could be the surreptitious alteration of software code before it’s distributed (think weapons systems or accounting software changes that cause changes in calculations leading to death or financial loss) or the alteration of financial or voting data. This may already have occurred and we just don’t know it.

Jablanski: States are beginning to recognize the emergence of offensive cyberwarfare capabilities. What potential challenges and vulnerabilities to weapons systems are most relevant in your opinion?

Zetter: There are a lot of questions and challenges still to be worked out around the use of offensive cyberweapons. What constitutes an act of digital warfare is one of the most basic. Every time there is a cyberattack involving



a nation-state, we have kneejerk reactions from lawmakers calling it war. We need to be clear about our use of language and not hype attacks for the sake of political gain. Aside from that, there are still questions around the government's use of zero-day exploits and the need for independent oversight around what gets retained for offensive use and what gets disclosed. There has been recent talk that the government plans to make the process a little more transparent and accountable, but we've seen no evidence of this yet. And of course the WannaCry attack last year has shone a light on the real dangers that can occur when governments fail to secure their cache of digital weapons.

With regard to vulnerabilities specifically to weapons systems, I mentioned earlier the concern about data integrity with regard to weapons systems, which could cause guns controlled by software, for example, to shoot off target. In the case of purely digital weapons, these are even more difficult to control; unless you're skilled at creating a virus/worm that is precise and targeted and won't cause collateral damage (and do sufficient testing to demonstrate that), you risk having destructive worms rampaging through networks causing unintended consequences. That can happen unintentionally with bugs you don't catch. But imagine

someone infiltrating your development environment for creating covert digital weapons and altering code so that your attacks have unintended consequences that lead your victim to retaliate with war. These are extreme circumstances, but history has shown that when you don't plan for extreme circumstances, you get surprised by them.

Jablanski: Over the next 30 years, the United States plans to spend more than \$1 trillion upgrading nearly every piece of its nuclear weapons systems—everything from communication and satellites to delivery systems. With increased digitization, what concerns does this raise for you from a cybersecurity standpoint?

Zetter: Anytime you digitize systems you make them more complex and you create new possibilities for vulnerabilities and new avenues for attack that didn't exist before. When industrial control systems were analog systems, you needed to physically destroy the wiring or equipment in person or with an aerial bomb. With digital systems, you now have to worry about remote attacks. These can occur over the Internet if the systems are connected online in any way, or connected to other systems that are online, or via removable media such as USB sticks if the systems are air-gapped from [not connected to] the Internet.



Obviously the security of nuclear weapons is more critical than even the electric grid, so the stakes are much higher when you're talking about introducing potential vulnerabilities into these systems when you digitize them. And it's even more important to have a supply chain that is controlled. I haven't seen any plans for this conversion, so it's not clear to me what exactly it's going to involve.

Supply-chain attacks could include things like logic bombs—malicious code designed to trigger at a future date—that get implanted in chips and hardware during the manufacturing stage or en route during shipment. These aren't theoretical attacks. Documents released by Edward Snowden show the NSA [National Security Agency] and CIA [Central Intelligence Agency] engaging in "interdictions"—intercepting routers, laptops, and other hardware on their way to end users and secretly installing spy code in them or some other malicious code.

The US has a history of digitizing systems without thinking through the potential consequences. Smart meters are one example: the government subsidized the cost of rolling out smart meters to homes and businesses because it would save utilities time and money if they could simply turn electricity on and off remotely and take readings of electricity and gas meters without having to send workers out to neighborhoods to read them. But they did this without conducting a security-impact assessment, installing systems that remote hackers could use to create blackouts in entire neighborhoods. It's the government's responsibility anytime it modernizes something—nuclear weapons systems in particular—to produce sound impact assessments

that lay out the potential security risks and explain how those will be addressed.

Jablanski: While states' cybercapabilities continue to be the most sophisticated, what have you seen in terms of the role of nonstate cyberthreats to classified networks and systems vital for national security?

Zetter: Governments don't like to admit when their classified networks are infiltrated, so I don't think we have a clear view of what has occurred in the past or is currently happening in that realm. But in general, state and nonstate actors don't have to be sophisticated to be effective. We saw this with the agent.btz infection that targeted military systems, including classified ones. The infection reportedly began with a USB stick that a soldier picked up at an Internet cafe and put into his work computer. Security vigilance is hard, and people let their guard down or violate security rules. There will always be ways to get into systems—even if you've developed means to keep out the malicious outsider, the insider threat is always going to be a problem.

As for the sophistication of nonstate actors, governments have to understand that nonstate actors learn from state actors. It used to be the other way around back in the early days of hacking, that the government learned from nonstate actors. People working for the NSA, CIA, and other agencies attended hacker conferences to learn about vulnerabilities and techniques they could use. Hacker knowledge trickled up from the lower levels. Now it's the other way around. Hackers are learning from nation-state attacks and co-opting their methods and tools. Government attack methods

trickle down, and targeted attacks and methods have the potential for becoming widespread.

Jablanski: Your book, *Countdown to Zero Day: Stuxnet and the Launch of the World's First Digital Weapon* detailed how a computer worm effectively sabotaged Iran's uranium enrichment program. I imagine you come up against a lot of barriers when looking into any cyberthreats. How do you get around classification and other roadblocks to getting the information you need for reporting?

Zetter: Covering national security has always been a challenge for reporters. But the methods for obtaining information haven't changed, just the tools have. You still get information through whistleblowers and other sources—sometimes through authorized government leaks or mistakes the government makes in redacting information. You can also obtain information when it gets exposed inadvertently in the way Stuxnet was. If it wasn't for the fact that Stuxnet's authors made errors that exposed the covert operation, we might not have learned about the attack against Iran's nuclear program unless an insider leaked the information. Had the operation been more successful, we might still not know about it.

But secrets are hard to keep forever—even when they're closely held in the way Stuxnet was. It's one of the things reporters count on—that information wants to be free. There are all kinds of reasons people will leak information: they want to shine a light on an important issue or policy that is not being debated; they want to expose waste, fraud, or a crime; they've exhausted other avenues of recourse for righting a wrong; or they feel the secrecy around something is unwarranted and see benefit in it being revealed. Sometimes they have an axe to grind and just want to see actions exposed. It can take a lot of work for reporters to get the information. But if you're patient and have a reputation for handling information and sources with integrity, sometimes the information will come to you without you having to go find it.

Jablanski: What are some of the most common misperceptions in discussing cybersecurity and weapons programs that you believe journalists can help debunk?

Zetter: That every attack is serious or merits coverage.

That every attack conducted by a nation-state with political motives is cyberwarfare.

That attribution is a solved problem—it may very well be possible to discern the attacker in some cases (particularly if

it involves signals intelligence where a spy agency is sitting on the computer of the attacker and watching them plan or perform the attack). But attackers are going to become more sophisticated at using false flags to hide their identity or point the finger at others, and the public and reporters have to be skeptical whenever a government or private security firm attributes an attack to a particular nation or actor. Stories should always carry caveats to this effect.

Jablanski: How do decision makers demonstrate to the public that they are taking adequate steps to maintain resilient systems, especially for nuclear weapons, given the sensitivity of those actions?

Zetter: I mentioned above that the government should be required to do a security-impact assessment before digitizing nuclear systems. This should be done by trusted third parties who don't have a stake in the program. Unfortunately, the kind of entity capable of doing this no longer exists because Congress defunded it.

The Office of Technology Assessment [OTA] for years provided expert assessments conducted by scientists, technical experts, and others who produced valuable reports advising lawmakers on the efficacy and drawbacks of planned programs and legislation. But lawmakers didn't like some of the conclusions that the OTA reports reached, since they clashed with what lobbyists or other interested parties wanted. If decision makers truly want the public to trust that they are taking adequate steps to maintain resilient systems, independent assessments are essential—both before and after a program is implemented.

Stuxnet was a computer worm that caused damage to Iran's nuclear program. First identified in 2010, it is thought to have been developed by American and Israeli intelligence. Stuxnet is considered the first known cyber-weapon to be released in the wild and is the first piece of malware aimed at causing physical destruction.

The **WannaCry** 2017 attack took advantage of an exploit in Microsoft Windows to spread ransomware on computers all over the world. North Korea has been blamed for the incident.

In 2008, a worm dubbed **agent.btz** infected US military computers. It spread after a USB flash drive was inserted into a laptop connected to US Central Command. It is suspected that Russian hackers were behind the attack.



Success Far From Certain

Secretary-General António Guterres
Takes on the United Nations' Systemic Weaknesses

By Alison Giffen

During his candidacy for secretary-general, António Guterres promised he would implement long overdue reforms at the United Nations. He didn't delay on delivering. In his first official remarks at UN Headquarters, he directed a clear message to UN personnel: "[We] need to recognize our shortcomings, to recognize our failures and where we are not able to deliver as we should."

Since then, Guterres has introduced ambitious reform initiatives that have raised expectations among member states. In 2018, Guterres will need to focus on prioritizing reform objectives, forging strong partnerships with influential member states, and leveraging the political environment, including downward pressure on the UN's budget, to his advantage.

Last year, Guterres rolled out three reform agendas: a plan to renovate the UN management paradigm, his vision for restructuring the United Nations' peace and security pillar, and an initiative to reposition the UN development system. Pursuing ambitious reform agendas has become habitual among secretaries-general. Like Guterres, his predecessors

tried to introduce extensive reforms early on in their first terms. In 1997, Kofi Annan announced a reform initiative during his first six months. In 2007, during his first month in office, Ban Ki-moon took steps to divide and reorganize the UN peace and security architecture.

Many of these efforts were scuttled by member states or internal bureaucratic infighting. As a result, a number of Guterres's reforms sound as if they have been simply cut and pasted from his predecessors' agendas. However, Guterres holds an advantage to prior secretaries-general. During his final three years in office, Ban initiated three comprehensive reviews: the *High-Level Independent Panel on Peace*



Nigerian peacekeepers serving with the UN Mission in Liberia stand in formation on January 12, 2018, during an inspection at their base. Peacekeeping operations are one of the most visible and tangible tools the United Nations has to implement its peace and security mandate in the field, and they are often the go-to intervention for the international community. (UN Photo/Albert González Farran)



Secretary-General António Guterres (right) meets in the outskirts of Kabul, Afghanistan, with some of the 800,000 Afghans displaced by conflict in last the 18 months, as part of his visit to the capital on June 14, 2017. During his candidacy for secretary-general, Guterres promised he would implement long overdue reforms at the United Nations. (UN Photo/ Fardin Waezi)

Operations, the *Global Study on the Implementation of United Nations Security Council Resolution 1325*, and *The Challenge of Sustaining Peace: The Report on the Review of the UN Peacebuilding Architecture*. All three reports were largely welcomed by member states, providing Guterres with a blueprint and a mandate for future action.

To succeed on his proposed reforms, Guterres needs to learn from the challenges his predecessors faced and adopt new methods to overcome internal UN and external member state resistance. His strategy will need to include three organizing principles: prioritization, partnership, and politics.

Peacekeeping operations are one of the most visible and tangible tools the United Nations has to implement its peace and security mandate in the field, and they are often the go-to intervention for the international community. Because of this, peacekeeping operation reform should be a priority. It is also a prism through which to explore the application of Guterres's recommended organizing principles.

Prioritization

In terms of assessment and planning, the United Nations needs to strengthen its methods of identifying threats to civilians, threats to UN personnel, and threats to political

objectives. Security Council members have repeatedly stated they don't have the information they need to sequence and prioritize mandates or to determine when and why missions are struggling to deliver. Distrust in the Secretariat's reporting contributes to Security Council members' inclination to push peacekeeping operations beyond what operations can realistically achieve. Within the Secretariat, the pressure to meet ambitious mandates exacerbates outdated and weak operational planning processes. This can result in mission footprints favoring deployments that are static and geographically dispersed. That in turn can undermine a mission's ability to protect civilians, complicate and raise the cost of logistics, and leave UN personnel more vulnerable to attack.

To ensure that peacekeeping operations can perform when deployed, they must be mobile and proactive. To achieve this, Security Council members must commit to supporting a range of recent or proposed reform efforts, including a new and improved force-generation system, new approaches to managing budgets and logistics, and effective human resource systems that facilitate the recruitment of skilled civilian personnel. Council members should also rally other member states to support these reforms and the price tags that accompany them. Of course, many

of these reforms are not and should not be the purview of the Security Council, but council members that advocate for ambitious and robust mandates must commit to supporting the secretary-general's implementation of management reforms and the costs of peacekeeping during UN General Assembly budget negotiations.

Large-scale protection failures in the Democratic Republic of the Congo and South Sudan have sparked laser-beam focus on accountability measures within UN peacekeeping operations. The Secretariat has taken steps to strengthen accountability, including developing a draft policy on the effective and accountable performance of protection-of-civilians mandates in UN peacekeeping operations. Nevertheless, accountability systems for mission leadership, civilian components, and uniformed personnel of UN peacekeeping operations remain nascent. Improved methods for measuring the performance of mission leaders, civilian components of missions, and uniformed personnel should recognize and reward good practices and identify weak links. In some cases, underperformance may be addressed through additional training, mentoring, or resources. In other cases, where there is a pattern of underperformance or egregious failures, individuals and units may need to be replaced. Accountability will not result in more successful reforms if it occurs behind closed doors. The secretary-general needs to regularly and transparently report on mission successes and failures.

Partnership

Member states hold the key to so many of these proposed reforms. Therefore, the secretary-general will have to develop a sophisticated strategy to build alliances with them. He will need to partner with reform-minded countries that contribute troops and police, Security Council members, and financial contributors to champion his reform agenda through their voice and vote in UN bodies and through public and private diplomacy in fellow member state capitals.

In addition, Guterres will need to encourage and support member states that have demonstrated leadership beyond the United Nations to reform peacekeeping. In 2015, the US government spearheaded the Leaders Summit on Peacekeeping, which convened numerous heads of state and resulted in pledges for more than 50,000 new uniformed personnel, enablers, and training. In 2016 and 2017, the United Kingdom and Canada hosted defense ministerials on peacekeeping that resulted in additional contributions. During these events, member states like Rwanda and Canada mobilized other member states to make public commitments to ready their troops and rally their governments to better protect civilians through The Kigali Principles on

the Protection of Civilians and The Vancouver Principles on Peacekeeping and the Prevention of the Recruitment and Use of Child Soldiers. This high-level political engagement in peacekeeping is necessary to achieve reforms.

Politics

Secretary-General Annan's various reform agendas were undermined in part by bullish unilateralism and financial pressure emanating from Washington. Guterres faces similar challenges. The Trump administration has sought to downsize peacekeeping operations and cut their budgets. On one hand, the US government's assertive efforts to link dollars to reforms could work in the secretary-general's favor. Threats to cut budgets create a political space for the secretary-general to push through the tougher reforms that some UN bureaucrats and member states seek to fight.

On the other hand, Guterres needs to effectively discourage indiscriminate budget cuts that are divorced from mandated objectives or that preempt reviews of mission performance. Guterres also has to be ready to fight for key priorities and corollary capabilities. Vehement public commitments by the United States to cut budgets during 2017 opened the door for member states that oppose UN efforts to promote human rights to downgrade or eliminate related peacekeeping operation posts. The secretary-general needs an effective strategic communications plan and advocacy strategy to ensure that progressive member states understand why these capabilities are important and why they should be prioritized.

Secretary-General Guterres's ability to successfully prioritize reforms, partner with member states, and manage the politics of influential member states to modernize UN peacekeeping operations will stand as the litmus test for the success of his broader reform agenda over the course of his term. The cost of failure to reform peacekeeping is significant. When UN peacekeeping operations falter, vulnerable people, often civilians, are at the highest risk. When peacekeepers cannot successfully deter violence, years of economic investment from member states and the private sector are lost. When peacekeeping operation advocacy to strengthen governance is ineffective, international crime, violent extremism, and cross-border threats to health flourish.



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More Alike Than Different

At the Iowa Student Global Leadership Conference, 132 Students From 53 Countries Made New Friends That Will Last a Lifetime

By Francie Williamson



New friendships and cultural connections flourished as foreign exchange students from across Iowa gathered Feb. 2–3, 2018, in Des Moines for two days of fun and learning. The Stanley Foundation first organized the Iowa Student Global Leadership Conference in 1995 with the goal of fostering global citizenship.

Getting-acquainted activities set the stage for delving deeper into some global issues. This provides an appropriate environment for people from many different countries to meet and learn from each other.

The first night, students learned about each other's cultures by sharing their countries' traditional dress, answering trivia questions, and taking part in a speed-friending activity. They later danced to popular international tunes and recorded short, silly vignettes that were made into souvenir books.

The next day, noted speaker Dean Jacobs delivered the key-note address. Jacobs told the students he decided to fulfill his dreams of traveling the world after a terrifying, near-death experience. "It's not the accumulation of stuff, it's the accumulation of experiences" that's important, Jacobs said.

The students learned about his journey to find the Seven Wonders of the World and how to apply the seven lessons he learned along the way. He challenged the students to ask themselves if they encounter each of these lessons—such as curiosity, humility, and respect—each day.

"We never let fear stop us," Jacobs said, emphasizing that students need to "dream big, live tall, to make the world better. Dreams aren't for special people, they're for everyone."

After lunch, the teens broke into small groups for student facilitator-led discussions on topics like climate change, nuclear weapons policy, education, Internet neutrality, agriculture, and poverty. They came back together to share their perspectives, many of which focused on how similar people are from around the world.





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