

**B**eads of sweat form on Alex Dehgan's brow as he steps through the mist and heat of the tropical conservatory at the US Botanic Garden in Washington DC. The air is not as hot and humid as in the forests of Madagascar, but the warmth reminds him of the two and a half years he spent there, studying lemur populations and surviving bouts of cerebral malaria, schistosomiasis and dysentery.

Dehgan enters the medicinal plant garden and finds the Madagascar periwinkle (*Catharanthus roseus*), a plant that led to key treatments for childhood leukaemia and is now endangered in its natural habitat. Famous for its biodiversity, Madagascar lost nearly 40% of its forests between the 1950s and 2000 — and probably many unknown plant and animal species, says Dehgan, who trained as an evolutionary biologist. “How many more things could we have found?” he wonders.

That's the kind of issue that has driven Dehgan over the past two decades. After an unorthodox career in science that has included setting up a national park in an active war zone in Afghanistan, Dehgan is betting his retirement on hacking the field of conservation. He wants to harness the power of technological innovation to transform the practice of preserving ecosystems and species.

Borrowing a page from Silicon Valley, he has launched a non-profit technology start-up called Conservation X Labs in Washington DC. Just four years old, the initiative is bringing new people into the field of conservation — including entrepreneurs, engineers, computer scientists and anthropologists. It aims to support research and development into technology that might aid conservation. Shaking up the field is essential, Dehgan says. “Unless we fundamentally change the model, the tools and the people working on conserving biodiversity, the prognosis is not good.”

One of the group's key tactics is setting up prizes to lure in fresh talent and ideas. So far, it has launched six competitions for tools to, among other things, limit the spread of infectious diseases, the trade in products made from endangered species and the decline of coral reefs. The first commercial product to be spun out of the start-up — a portable DNA scanner — is slated for release by the end of the year.

Conservation X Labs stands out both for the funding it is bringing to the field and for building collaborations with technologists who might not otherwise have thought about conservation work, says Geoffrey Dabelko, a political scientist focused on the environment at Ohio University in Athens. As co-founder and chief executive, Dehgan has big hopes for the organization and the prospect of combatting a precipitous loss in biodiversity around

# HACKING CONSERVATION

*Evolutionary biologist and lawyer Alex Dehgan is using tactics from the technology industry to tackle threats to biodiversity.*

BY LISA PALMER



the world. “Alex challenges assumptions of who is a conservationist,” Dabelko says, “and his level of ambition is uncommon.”

### INNOVATION INFUSION

Conservation biologists tend to travel widely, but few have such a diverse background as Dehgan. Born in Iran, he grew up in the United States, and studied zoology and political science at university before earning a law degree. In the 1990s, he went to Russia to help develop the country's first environmental laws after the collapse of the Soviet Union, and he even lived for a time in the Moscow Zoo to avoid being kidnapped. He then earned a PhD in evolutionary biology and eventually went to Iraq in 2004, where he trained former weapons scientists to work in fields such as ecology and conservation biology. A few years later, he joined the Wildlife Conservation Society in Afghanistan's post-conflict war zone to complete the country's first extensive wildlife surveys in 30 years and establish its first national park, Band-e-Amir.

Dehgan caught the tech-innovation bug in his roles as science adviser and chief scientist at the US Agency for International Development (USAID), the federal agency responsible for civilian foreign aid and development help. While there in the early 2010s, he resuscitated the agency's science programme and launched its Global Development Lab, which is devoted to blue-skies research. He also saw the successes of the Saving Lives at Birth programme, an international effort co-sponsored by USAID. That initiative helped to widen adoption of the Pratt Pouch — technology designed to preserve antiretroviral medications that can be used in infants to prevent HIV infections shortly after birth. One of its challenges also spurred the development of the Odon Device — an innovation for assisting in vaginal births that was developed by a car mechanic from Argentina.

After he left USAID in 2014, Dehgan turned down executive leadership roles in academia and established organizations, and decided instead to take a leap into something out of the ordinary. He launched Conservation X Labs in 2015 in partnership with Paul Bunje, then chief scientist at the XPrize Foundation.

Since its founding, Conservation X Labs has awarded US\$3.3 million through its challenges. It has, for example, partnered with the US National Park Service and the US Department of the Interior on a \$70,000 prize for early

detection of the fungi that are killing Hawaii's iconic Ōhi'a (*Metrosideros polymorpha*) tree, a backbone of native forests and watersheds. Fungal pathogens, carried by an invasive ambrosia beetle, have been killing the trees at alarming rates since at least 2010, and the disease is spreading rapidly. J. B. Friday, a forester at the University of Hawai'i at Mānoa, says that a competition could help spur a rapid response to the outbreak. “If good, smart people over the world are thinking about this and can bring us ideas we haven't thought of,” he says, “that would be great to know.” Proposals are currently being evaluated for the competition, which closed for submissions in April.

Dehgan hopes that the organization's prizes and other initiatives will bring innovative solutions to conservation's deepest problems. Hundreds of people have already been lured in through challenges and engineering programmes such as Make for the Planet — a

multi-day, in-person event — and an online tech collaboration platform called Digital Makerspace, which matches conservationists with technical talent.

One innovation that has come out of Conservation X Labs is ChimpFace, facial-recognition software designed to combat chimpanzee trafficking that happens through sales over the Internet. A conservationist came up with the idea, Dehgan explains, but she didn't have the technical expertise needed to achieve her vision. Digital Makerspace helped her to form a team to develop the technology, which uses algorithms that have been

trained on thousands of photos provided by the Jane Goodall Institute. ChimpFace can determine whether a chimp for sale has been taken illegally from the wild, because those animals have been catalogued.

Conservation X Labs, which boasts a full-time staff of 15, is also developing its own technology, including a hand-held, battery-powered device known as the DNA Barcode Scanner. The device is designed to allow park rangers, customs officers, supply-chain inspectors and law-enforcement officials to find the genetic identity of items at very low cost, including endangered and protected wood and seafood species, and oft-disguised wildlife products such as rhino horn or pangolin scales.

The scanner could be available as early as the end of this year, through a newly formed for-profit company called Thylacine Biosciences in Seattle, Washington. It is expected to cost around \$100, which would make it an order of magnitude less expensive than other hand-held DNA devices, says Dehgan. An added bonus is that people don't need to be able to read to use it.

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There is a race to deploy such technologies, says Kim Warner, senior scientist at Oceana, an environmental non-profit organization in Washington DC. Inexpensive and easy-to-use scanners are really needed to “make decisions at the border, to know what's coming in and what is going out”, she says. “The most rapid method now takes two or three days, and you need trained personnel to interpret the results.”

Dehgan says that fresh approaches are needed because the field has been slow to change and is struggling to find solutions to huge issues. One problem is that the field is “filled with conservationists”, he says. “The Society for Conservation Biology is a society of professional mourners who lament and describe the passing of species.” Dehgan, who is a member of the society and served on its board of governors from 2012 to 2015, asserts that too much human behaviour and innovation are left out of conservation.

Michael Mascia, who became president of the society in 2017, says the group has been focused on solutions for some time, but that it has evolved to include more social science and, recently, more technology. Mascia is the first social scientist to serve as president, and leads research at the Betty and Gordon Moore Center for Science at Conservation International in Arlington, Virginia. His institution is partnering with Dehgan's group on a prize-backed challenge aimed at artisanal mining, and he says that Conservation X Labs is playing a key part in building a bridge between emerging technology and field deployment.

Others are contributing, too, Mascia says. Microsoft has launched its AI for Earth programme, a five-year, \$50-million effort to apply artificial intelligence to environmental challenges. And various projects have arisen from Google X, among them one that aims to bring Internet connectivity to remote places by balloon. But, Mascia says, “tech is not going to solve all our problems. Conservation is a social process, and it requires people to make choices and potentially change their behaviour.”

As it seeks to refashion the field, Conservation X Labs is facing some challenges. Foundations find it difficult to support the group's atypical mission as a non-profit conservation-tech effort, Dehgan says. The company must compete with large tech firms to hire engineers to build devices. And collaborating with conventional conservation organizations brings problems, too. Often, he says, the missions don't align: many are focused on creating preserves instead of on specific human factors that might be driving extinction, such as the economics of animal trafficking.

Still, Dehgan sees ample opportunity to make progress. “Humans have caused these problems,” he says. “And we have the ability to solve them.” ■

*Lisa Palmer is a journalist and senior fellow at the National Socio-Environmental Synthesis Center based in Annapolis, Maryland.*