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15 The Utopia for the Golden Frog of Panama

Eben Kirksey

Utopian worlds are ever-present in science fiction, where the projection of new heavens is never far from the emergence of new hells (Williams 1978, 212). Utopias can also function as diagnostic tools. To paraphrase Isabelle Stengers, they are learning grounds for resisting what today opportunistically frames our world (Stengers 2011, 347). In collaboration with Grayson Earle, a digital artist, and Mike Khadavi, a frog enthusiast who designs custom aquariums, I attempted to create a learning ground—an artwork called *The Utopia for the Golden Frog of Panama*—to diagnose cryopolitical problems associated with biodiversity conservation initiatives. Around the world, species of frogs are dying. A global assemblage of biosecure holding facilities and cryogenic banks called the Amphibian Ark has been built to save species of frogs that cannot currently exist in the wild.[1] Thousands of frogs will remain within the Ark, a place where science fictions meet Christian messianic traditions, until circumstances change (cf. Haraway 2014). This chapter uses the fate of one particular species, the golden frog of Panama, to examine the politics of efforts to forestall extinction.

At the register of materials, *The Utopia for the Golden Frog of Panama* was a repurposed refrigerator with a window enabling viewers to observe endangered frogs as they were subjected to the ambivalent grace of salvation. Our "utopia" was pregnant with irony. Living within a refrigerator, in conditions of incarceration, is certainly not utopic, not even for a frog. Our goal in creating this art installation was to catalyze conversation about the genuine ethical and logistical difficulties that emerge when one grapples with endangered life forms in the early twenty-first century. Taking a page from *Tactical Biopolitics*, a 2008 book by Beatriz da Costa and Kavita Philip that brings the ideas of Michel Foucault into conversation with tactical media practices in the arts, we made a concrete proposal for managing life and

death differently (da Costa and Philip 2008). Rather than just offer a critique of standard zoological practices, this installation served as an opening to possible futures.

The Utopia for the Golden Frog of Panama also offers a figural window into the Amphibian Ark. Our intervention aimed to expose strategies for managing life and death within zoological facilities (see da Costa and Philip 2008; Catts and Zurr 2008, 131). By placing ethnographic descriptions of the Amphibian Ark alongside an account of the creation of our own humble utopia, this essay chronicles the actions of people whose love for some kinds of life has led them to construct novel ecosystems—bringing machines, industrial supply chains, and biological elements together into unusual assemblages (see also Kirksey 2015). Within Amphibian Ark facilities I found people committed to the practical work of care whose imaginations were constantly probing future horizons (see van Dooren 2014b; Crapanzano 2004). As the Ark ran out of space, as zoo keepers started killing frogs to keep populations manageable, caretakers imagined possible futures where the animals might escape their present circumstances.

The Year of the Frog (Panama, December 2008)

A comfortable breeze from the air conditioner, a steady 24 degrees Celsius, hit the zoo keeper in the face as she was greeted by the familiar burbling from the aeration tubes and hum of the air pumps. The slash/chink rhythm of a machete, cutting the grass outside, was still audible over the automated systems of the El Valle Amphibian Conservation Center (EVACC, pronounced like *evac-uation*). She washed her hands with antibacterial soap in the sink and put on a pair of powderless rubber gloves. At the top of a new page in the log, a cheap spiral notebook, she wrote: "21 December 2008, *Atelopus* room." Peering into the first couple of tanks, she found little to report in the log: "0 fecal, 0 food left, one frog on plant, one hiding in peat moss." Spritzing each tank with a blast from the garden hose, with the nozzle turned to the *mist* setting, she quickly moved down the row.

EVACC is "a space age amphibian center nestled in the heart of an extinct volcanic crater" in the highlands of Panama, in the words of Lucy Cook, who writes the Amphibian Avenger blog. She describes EVACC as "a terrifying vision of the future where frogs survive in sterile pods and crocs

Figure 15.1
Heidi Ross amid her daily routine of care at EVACC in El Valle, Panama. Photograph by Lucy Cook.

are mandatory footwear" (Cook 2010).[2] The Amphibian Avenger blog is dedicated to "the ugly, the freakish and the unloved animals that are perilously ignored thanks to the tyranny of cute" (ibid.). When Lucy Cook visited the EVACC facility, she was delighted to find "freakish" species living alongside cute frogs.

During my own visit to EVACC, I found human caretakers who had become emotionally and ethically entangled with creatures in their care, people who were committed to the practical labor of keeping frogs alive and helping them flourish in an era of extinction. Rather than terrifying visions of the future, I found practical applications of Donna Haraway's "cyborg politics," the forging of new links between biotic elements and technology (Haraway 1985). Organisms and machines had been joined together to ground modest hopes, creating the possibility for a shared future.

Reaching into tank 12 with gloved hands, turning over each leaf, the scientist struggled to locate all of the frogs. This tank was home to half a

dozen lemur leaf frogs (*Agalychnis lemur*).[3] Lemur leaf frogs are nocturnal and spend daylight hours tucked up under leaves. At night, when the lemur leaf frogs are active, they are a reddish color, but during the day they assume a vibrant green. As she worked, some of the lemurs popped open their huge white eyes and began climbing toward the tank lid on spindly legs. The lemur tank was full of feces, as usual. She twisted the nozzle of the hose and began washing off the oblong blobs of mostly digested fruit flies through the wire mesh at the bottom of the tank.

In the wild, frogs hop away from their feces, reducing the risk of reinfecting themselves with diseases. Nematode worms and other parasites lay eggs in the digestive tracts of frogs and accumulate in the fecal pellets. Washing the feces away every day, and occasionally treating infected animals with drugs, helps maintain low parasite counts. Changing rubber gloves between tanks, or at least every time a glove contacts feces, protects the frogs from infecting each other. Every few days, the unbleached paper towels lining the bottom of the tanks are discarded and replaced. The trash stream of rubber gloves and paper towels is only one dimension of the costs incurred in keeping these endangered amphibians alive. Each month EVACC runs up an electricity bill of around $800 USD.

The EVACC facility is a fragile bubble of happiness sustained by a husband-and-wife team: Edgardo Griffith, a twenty-eight-year-old Panamanian biologist who often sports surfer's glasses, and Heidi Ross, an expatriate from the United States. It was created as a response to the growing sense of dread as a fungal disease spread across the highlands of Central America in a steady wave, about fifteen miles a year, driving scores of species to the brink of extinction. In March 2006, Edgardo "spotted a dead frog in a stream near El Valle. Its limbs were splayed out, and its skin was peeling. He scooped it up, went home and cried."[4] As the disease hit, Edgardo and Heidi set about collecting frogs and keeping them in conditions of strict biosecurity. They began working as *bricoleurs* and entrepreneurs, assembling networks of organisms and objects, making do with whatever beings and things were at hand. Hundreds of frogs took up temporary residence in a few vacant rooms of Hotel Campestre, a backpacker hotel in El Valle. Edgardo and Heidi began to cobble together everyday technologies into a life support system to protect frogs from the pathogenic fungus.

The Panamanian golden frog, *Atelopus zeteki*, quickly became a poster child for international conservation efforts. In any absolute sense, the

Figures 15.2, 15.3
A robust population of lemur frogs (*Hylomantis lemur*), a notably "cute" frog species, lives in the EVACC facility. Until recently this species was thought to be extinct in the neighboring country of Costa Rica, but then breeding populations were found on an abandoned farm and in a forested area near Barbilla National Park. The life cycle of the banded horned tree frog (*Hemiphractus fasciatus*, right) gives Rosalyn Diprose's (2002) notion of corporeal generosity a new twist. Eggs get pushed into a sack on the female's back as the male fertilizes them. These frogs breed by direct development, which means that when they are born, they pop out as small frogs instead of baby tadpoles. Then they stick around for a while, taking a ride on their mother's back. (Photographs by Brian Gratwicke and Edgardo Griffith. CC-BY-2.0, http://creativecommons.org/licenses/by/2.0, via Wikimedia Commons, http://fr.wikipedia.org/wiki/Agalychnis_lemur.)

Figure 15.4
Edgardo Griffith and Heidi Ross inside EVACC.

golden frog is not cuter than the lemur frog or the horned tree frog. But, as this species reportedly went extinct in the wild in 2008, Edgardo and Heidi became famous since they were keeping the last known populations alive in Panama within their facility. Locally the couple became renowned for their golden-frog-mobile, a four-wheel-drive jeep painted yellow with black stripes. Golden frogs are featured on Panamanian lottery tickets and have been scripted into stories about national patrimony and heritage. In conservation circles, golden frogs quickly became a flagship species—surrogates that routinely stand in for other unloved frog species in fundraising campaigns. These charismatic animals captivated the imaginations of professional conservation biologists, volunteers, and donors, because they fit a

new and hopeful storyline. On the brink of extinction within their natal ecological communities, the golden frog has been saved by technological and scientific interventions.

Amid a demanding routine of daily care for the frogs living in Hotel Campestre, Edgardo and Heidi also began to navigate oblique powers structuring uneasy north–south relations (cf. García Canclini 2005). Wrangling with diverging values and obligations, they explored nonhierarchical modes of coexistence with large institutions. Major donors from North America—namely the Atlanta Botanical Gardens, Zoo Atlanta, and the Houston Zoo—began to lay the foundations for the EVACC buildings nearby, tailor-making a biosecure facility at a local zoo to replace their makeshift facility at Hotel Campestre. The Amphibian Ark, a transnational organization with a mission to "ensure the global survival of amphibians," became involved only after Edgardo and Heidi moved their frogs to the new building. The Ark was attempting to enroll facilities like EVACC into a global network of institutions "focusing on [species] that cannot currently be safeguarded in nature."[5] Visionaries at the helm of this Ark were producing hopes for endangered frogs at the intersection of concrete actions of care in the historical present and messianic dreams about a future to come (Rose, this vol.).

The Amphibian Ark dubbed 2008, the year I visited the EVACC facility, "the Year of the Frog." Kevin Zipple, the founder and principal leader of this global Ark, was aiming to raise a $50 million endowment to preserve endangered frog species in perpetuity. Upward of 3,900 species of amphibians, over one-half of all described frogs, salamanders, and caecilians, are in trouble according to the Ark's accounting.[6] In October 2007, as Zipple prepared to launch the Year of the Frog, he gave a speech at the Jackson Hole Wildlife Film Festival, where key gatekeepers for National Geographic, the Smithsonian, Discovery, Animal Planet, the journal *Nature*, and several other international media organizations were in attendance. His speech,

Figure 15.5
The logo for the Amphibian Ark's 2008 fundraising campaign.

showcasing the plight of the golden frog of Panama, opened with a provocative line: "Hi, I'm Kevin, and I'm building an ark." He continued:

> "Amphibians are our modern day canaries in the coal mine," Zipple told the assembled VIPs.
>
> "Just as the miners would take these sensitive birds with them into the mines, and they would know if the birds died it was time to get out. Amphibians are raising and waving red flags to us, saying: '*There is a serious problem, you need to change your behavior, or you are going to suffer the same consequences*.'
>
> "A recent assessment of all amphibian species revealed that nearly half are declining. Somewhere between a third and a half are threatened with extinction. Just within in the past few decades well over 100 have already gone extinct. This is far more severe than what we see with other vertebrate groups. And for every bird or mammal species that is threatened with extinction, there are two to three amphibian species that are on the verge."[7]

Kevin's rhetoric echoes Al Gore's language from *An Inconvenient Truth*, a 2006 documentary about global warming. This film has a secular apocalyptic narrative; it is a revoicing of environmental science in the language of evangelical Christianity. These narratives use elements of the jeremiad, a type of Protestant political sermon lamenting that people have fallen into sinful ways and face ruin unless they swiftly reform. "Doom is imminent—but conditional, not inevitable," Susan Friend Harding writes; "It can be reversed by human action, but time is short" (Harding 2009). In Zipple's speech, amphibians serve as sentinels, their fate foreshadowing that of humans. Ongoing extinctions of frogs, salamanders, and caecilians prefigure a possible future event in his imagination—the extinction of the human species.

Jacques Derrida draws a helpful distinction between *apocalyptic* and *messianic* thinking (discussed in Jameson 1999, 63–64). Whereas apocalyptic thinking looks toward absolute endings, messianic hopes, according to Derrida, contain "the attraction, invincible élan or affirmation of an unpredictable future-to-come (or even of a past-to-come-again)" (Derrida 1999, 253–254). "Not only must one not renounce the emancipatory desire," Derrida continues, "it is necessary to insist on it more than ever" (Derrida 1994, 74). As a figurehead at the helm of the Amphibian Ark, Kevin Zipple was not just focused on definitive endings. As scores of frog species were going extinct, he was trying to open up a moment of revolutionary time—a moment when collective hopes about "saving the environment" or "preserving nature" might coalesce around the future of actual animals.

Derrida's hopeful sense of expectation is not oriented toward a specific Messiah. In contrast to Christian traditions, which pin hopes to the figure of Jesus Christ, Derrida's notion of messianicity is "without content" (Derrida 1994, 2004). Celebrating messianic desires that operate beyond the confines of any particular figure, he describes a universal structure of feeling that works independently of any specific historical moment or cultural location—a quasi-transcendental force he calls "messianicity without messianism" (Derrida 1999, 253). Derrida suggests that we should literally expect the unexpected by waiting for mysterious possibilities that are beyond our imaginative horizons (cf. Crapanzano 2004). Rather than pin hopes on something concrete, Derrida would have us wait for nothing in particular. Whereas the empty dreamscape of Derrida is haunted by a messianic spirit that refuses to be grounded in a particular figure, Kevin Zipple's imagination was focused on something specific: creating a livable future for a multitude of endangered animals. In other words, he was grounding modest biocultural hopes in hybrid assemblages of nature, culture, and technology (cf. Kirksey et al. 2014; Fortun 2001).

Messianic hopes in the biosciences are often problematic when they involve what Donna Haraway describes as "misplaced concreteness" (Haraway 1997b, 269). Biotech ventures have been criticized for using messianic discourse to focus the hopes of researchers, venture capitalists, and consumers on things that are too specific—like a gene, or a new pharmaceutical drug, or the resurrected cells of an extinct species (Fortun 2001; Sunder Rajan 2006). In terms of the Amphibian Ark, Zipple revoices speculative fictions and fabulations that have emerged at the intersection of biological sciences and economic enterprise to turn the rhetorical power of messianic discourse from producing profit for humans, to producing future generations of organisms he loves for their own sake (Haraway 2014).

Awareness of the scale of the extinction wave sweeping through the worlds of amphibians led Zipple to recognize that isolated local efforts, like the EVACC facility in the highlands of Panama, were not capable of addressing the global crisis. Extinctions were taking place along a "dull edge" of time, in the words of Thom van Dooren, with a drawn-out and ongoing process of loss taking place long before and well after the final death (van Dooren 2014b). Against a prevailing sense of homogeneous, empty time—when nothing really seemed to change even amid definitive extinction events—Zipple was trying to open up revolutionary possibilities

with his messianic language (see Benjamin 1968). He intended to galvanize the conservation community to raise an endowment to preserve frogs for eternity in biosecure breeding facilities and cryogenic banks. But the Year of the Frog, 2008, coincided with global financial disaster. Raising less than $1 million out of the $50 million goal of their capital campaign, the Amphibian Ark barely stayed afloat, scarcely covering their 2008 operating expenses.

Live Free or Die

Salvation can be an ambivalent grace. When animals are given the label "endangered species," according to Donna Haraway, they become subjected to the uncertain prospects of "being saved through a regulatory and technological apparatus of ecological and reproductive management" (Haraway 2014). While zoos and other breeding facilities style themselves as "salvific arks, bearing life's remnant and our hopes for redemption," this rhetoric often masks hidden regimes of violence (Chrulew 2011). As the messianic vision of Kevin Zipple largely failed to materialize—in the absence of an endowment capable of sustaining the life of endangered frog species in perpetuity—many committed caretakers like Edgardo Griffith and Heidi Ross soldiered on with limited resources, working to imagine and craft better futures for the animals in their facility. Others, with different political and ethical commitments, adopted more violent forms of care (see van Dooren 2014a,b).

After returning to the United States from Panama, I learned that another breeding population of golden frogs had been airlifted out of the country in 1999. The US military occupation of Panama, which had lasted nearly one hundred years, ended this same year. Scores of golden frogs were collected for a captive breeding program in the United States that continued a long history of unilateral action. The breeding program was aimed at "conserving genetic variability and maintaining viable captive populations." The Maryland Zoo in Baltimore was given an import permit, in accordance with the Convention for the International Trade in Endangered Species (CITES). This permit granted "ownership of the animals" to the zoo, rather than the Republic of Panama.[8]

After a few false starts, the Maryland Zoo enjoyed success in breeding golden frogs. Perhaps they were too successful. Every time breeding pairs

mated they produced some 200–900 white eggs. Initially the biologists overseeing this conservation program were delighted at the fecundity of these animals. They were happy to see frogs flourishing within the artificial ecosystems they created. Soon, however, the Maryland Zoo ran out of space. They began shipping frogs around the United States—in plastic Gladware deli cups lined with damp toilet paper—to other zoos. These frogs are now common features of reptile houses. They are on display at institutions throughout North America: the Bronx Zoo, the Smithsonian's National Zoological Park in Washington, DC, the Atlanta Botanical Garden, the Toronto Zoo, and Busch Gardens in Tampa, Florida.[9]

As the zoological community began to run out of space, zookeepers in Baltimore started killing Panamanian golden frogs by the hundreds. Even after this species was presumed extinct in the wild, zoos culled their captive populations—selecting the most "genetically valuable" individuals to live. In July 2012 at "Herp Happy Hour" in Washington, DC, a monthly meetup of reptile and amphibian experts, one zookeeper told me: "Every time we have a new clutch of golden frogs I have to select sixty of the healthiest frogs to live. I can't stand the job of killing an endangered species, so I make my boss come in and euthanize the ones I don't select."[10] Writing of related dilemmas among bird conservationists, Thom van Dooren suggests that "many of us would still choose the violence of a conservation grounded in captive breeding over that of extinction" (van Dooren 2014b). Despite this, he insists that we "cannot be allowed to erase the genuine ethical difficulties," and that we should "consciously dwell within them, in an effort to, wherever possible, work towards something better" (ibid.).

Writing of interspecies love in the age of extinction, Deborah Bird Rose has argued for an ethics of care that does not exclude the possibility of death. "An ethical response to the call of others does not hinge on killing or not killing," she argues (Rose 2011, 18). Rather, the question becomes: What constitutes a good death? One prominent frog biologist who was also at the Herp Happy Hour in Washington told me that a "good death" cannot come from euthanasia at the hands of a zookeeper. Amid a sedate and melancholic conversation about biodiversity loss, financial woes, and zoo overcrowding, she suddenly slammed down her glass, spilling margarita on the table. Lifting her hand in a parody of a revolutionary salute, she shouted: "Live free or die!"

A deadly fungal disease is still present in the highlands of Panama. If the golden frogs were reintroduced to Panama and released, most would probably die. But by the reckoning of this researcher, a "good death" in the wild, connected to the hopes of adaptation and survival, is better than a "bad death" at the hands of a zookeeper. Despite hopes that some robust frogs might live if released, influential members of the conservation community are reluctant to let them go.

Michel Foucault understood the modern zoological garden as "a sort of happy, universalizing heterotopia" where "several spaces, several sites that are in themselves incompatible" are juxtaposed in a single real space (Foucault 1986). Zoos are indeed cosmopolitan collections of animals. As such, they are also breeding grounds for diseases from diverse corners of the world. Recent findings by veterinary pathologists suggest that zoos might be better understood as heterotopic hotbeds of parasitic protozoa, fungi, viruses, and bacteria. The officials of the Maryland Zoo are thus reluctant to send thousands of golden frogs back to Panama when they might not only succumb to the known fungal disease, but also inadvertently spread new amphibian diseases picked up during their stay in US zoological collections.

The Frog Fridge

My ethnographic methods involved volunteering time to care for frogs that had gone extinct in the wild. As a participant observer at facilities associated with the Amphibian Ark in Panama, as well as the Bronx Zoo in New York City, I cleaned cages, prepared food, and fed animals alongside zookeepers who were overworked and underpaid. While observing the toll of mind-numbing routines on human laborers and the cramped conditions for tens of thousands of animals living within a regime of institutionalized care, I crafted a concrete proposal for doing things differently. Grayson Earle, Mike Khadavi, and I created our collaborative artwork—*The Utopia for the Golden Frog of Panama*—in hopes of saving a few animals from euthanasia. We created our own biosecure holding tank. We adapted and used technologies that were ready-at-hand: household appliances, cheap digital hardware, and some specialized equipment from pet stores (cf. de Certeau 1998; da Costa and Philip 2008, xvii).

Our utopia was housed in an unused refrigerator enhanced with custom digital equipment, an aquarium, and a living ecosystem. This installation was our best attempt to interpret the interests and needs of another species. Hacking into the refrigerator with a power saw, we put a glass window in the front door. Grayson Earle also hacked into the electrical system of the refrigerator, creating a digital thermostat, using an Arduino, a small programmable microcontroller, to keep the fridge within 68–73°F daily, the ideal thermal range for golden frogs. Even as other kinds of animals were on the brink of extinction in polar regions, we retrofit one cooling machine as a cryopolitical proposal (see Radin and Kowal, this vol.).

We installed this artwork in Proteus Gowanus, an interdisciplinary gallery and reading room in Brooklyn. Golden frogs, a species endemic to cool highland climes of Central America, needed the retrofit refrigerator to survive the hot New York City summer. The fridge also provided resident frogs with an added layer of protection from the Gowanus Canal, a superfund site just outside the gallery that was laden with industrial toxins.[11] This installation at Proteus Gowanus was part of The Multispecies Salon, an exhibit that leveraged partnerships between artists and ethnographers to explore a set of interrelated questions:

> Which beings flourish, and which fail, when natural and cultural worlds intermingle and collide? What happens when the bodies of organisms, and even entire ecosystems, are enlisted in the schemes of biotechnology and the dreams of biocapitalism? And finally, in the aftermath of disasters—in blasted landscapes that have been transformed by multiple catastrophes—what are the possibilities of biocultural hope? (Kirksey 2014)

We speculated that frogs living in sterile tanks, sitting day after day on a damp paper towel might—isolated from other species and companions that make forests livable and lively places—experience a sense of cosmic loneliness. As a partial solution to this problem, Mike Khadavi assembled a miniature ecosystem inside of the refrigerator with useful mosses and vascular plants collected from diverse corners of the globe. These plants were capable of generating enough oxygen to keep a small population of frogs alive. This feature, which meant that the frog fridge rarely needed to be opened, arguably made it more biosecure than the large pods of the Amphibian Ark, where humans were constantly coming and going, where frogs were living cheek-and-jowl with other amphibians in a heterotopic hotbed of disease. We also created a special composting system inside the tank and seeded

Figure 15.6
Grayson Earle pictured next to *The Utopia for the Golden Frog of Panama* at the Multispecies Salon in Brooklyn. Photograph by Eben Kirksey.

it with wingless *Drosophila melanogaster* and flightless *Drosophila hydei* mutants, which we ordered from an online retailer (Ed's Fly Meat, flymeat.com).[12] While we made no pretense of establishing conditions of sterility—conditions that are no more achievable in zoos or Amphibian Ark facilities—we carefully selected other species that have been demonstrated to be good for frogs to live with in multispecies worlds.

Aside from occasionally adding human food waste to the composting system, to generate future generations of fruit flies, *The Utopia for the Golden Frog* was built to function in relative autonomy—as long as it was plugged

in to an electrical outlet. We mounted a webcam inside for live viewing, and posted a digital archive of temperature and humidity readings, enabling anyone who was interested to verify we had met the technical requirements to sustain the life of this species. In other words, we exposed our micro-biopolitical intervention to dominant regimes of biopolitics—opening up the frog fridge to regimes of surveillance (cf. Paxson 2014). Rather than Jeremy Bentham's Panopticon, where there might or might not be someone observing from a figural guard tower, we worked to recreate Bruno Latour's Oligopticon—where technologies of surveillance would enable a small group of people to accurately monitor an object of interest (Foucault and Sheridan 1991, 195; Latour 2005, 181).

After assembling *The Utopia for the Golden Frog*, and installing it for the opening of the Multispecies Salon in Brooklyn, I sent an email to the Maryland Zoo in Baltimore requesting frogs to populate the habitat. Kevin Murphy, Assistant Curator at the Zoo, was the "stud book holder" for the golden frog, a designation by the Association of Zoos and Aquariums (AZA) for the person who "dynamically documents the pedigree and entire demographic history of each individual in a population of a species."[13] In my email to Murphy, I asked how "I might submit a formal application to borrow some *Atelopus zeteki* adults for a temporary artistic display about the amphibian mass extinction crisis." I outlined the technical specifications of the frog fridge, adding: "The tank does not have any running water, so based on what I have learned about *Atelopus* reproductive biology I trust that this means the frogs won't be trying to breed."

Murphy wrote a friendly but dismissive note back, saying:

> Unfortunately we are not able to provide golden frogs to non-AZA institutions. The original permitting agreement with the United States Fish and Wildlife Service (USFWS) specifically prevents us from doing so. When we provide frogs to Universities for research the proposal has to clear The Zoo's Institutional Animal Care and Use Committee and we need to receive authorization from USFWS. Golden frogs are an endangered species and quite possibly functionally extinct in the wild so they are pretty heavily regulated.[14]

In parallel to this exchange with Murphy, I lobbied influential movers and shakers in amphibian worlds. But, I ultimately failed to convince the Maryland Zoo and the US Fish and Wildlife Service that a few frogs should be saved from euthanasia and kept in our modified, non-AZA affiliated refrigerator.

Capture and Escape

Kevin Murphy traveled to Panama in November 2013 to take part in a five-day workshop about the future of the Panamanian golden frog. Twenty-seven research scientists, conservationists, zookeepers, and government officials convened in El Valle, the site of Edgardo and Heidi's EVACC facility. They worked through tangled thickets of ethical, logistical, political, and epidemiological issues that plague conservation initiatives across national borders. Passions became inflamed, according to one attendee, when the subject of repatriating the golden frogs currently living in the United States was discussed. No one brought up the uncomfortable subject of euthanizing frogs, or the long legacy of unilateral action by US agents in the region, but the Panamanian delegation did repeatedly insist that their North American counterparts urgently needed to start finding new creative solutions to the problems at hand.[15]

The US zoological community had enfolded the golden frog into an emergent ecosystem—a system of holding tanks, public displays, and revenue-generating visitor attractions—that shows promise of sustaining itself into the future. The frogs had become entangled in a complex network of institutional alliances, bound to agents who had a vested interest in the status quo. Kevin Murphy and other US conservationists who visited El Valle in November 2013 were having difficulty imagining a time when they would have to let go. Thousands of golden frogs were being held fast by agents and institutions with competing values and obligations. These animals were entangled in relations of reciprocal capture. "In the case of symbiosis," writes Isabelle Stengers, reciprocal capture "is found to be positive: each of the beings coinvented by the relationship has an interest … in seeing the other maintain its existence" (Stengers 2010, 35–36). The case of golden frogs and US zoos is an example of reciprocal capture where the relationship is not entirely positive. I could only find hope in this contingent relationship if it contained the possibility that the frogs might one day escape.

The Maryland Zoo, the legal "owner" of the golden frogs, was entrusted by the US Fish and Wildlife Service to guard against this very possibility—that the frogs could escape not only their artificial zoo-based habitat, but also to escape regulation. The fear of the conservation officials, Kevin Zipple intimated, was that people—perhaps those involved with the market for

rare and exotic animals—would collect any remaining golden frogs in the wilds of Panama, some of the most "genetically valuable" individuals in existence, and then launder them as animals bred in captivity. A small population of golden frogs was, in fact, recently rediscovered in Panama. The hopes of conservationists, who once presumed that this species was extinct in the wild, have been placed on the living figures of these frogs.

When I told Zipple about my art intervention, *The Utopia for the Golden Frog of Panama*, I descried it as modest proposal for letting citizen scientists participate in the effort to care for endangered species. Working with his own words, I said: "It seems like any way of expanding the carrying capacity of the Ark would be a good thing." "I agree," Zipple responded, before adding, "But, a lot of people in the private sector are motivated by the value of these animals. There is a tendency to sell them on the black market. There are just so many complicating factors to citizen involvement."

People who trade in endangered species, who collect them in the wild and sell them as pets, are certainly one of the problems leading to extinction. The pet trade for reptiles and amphibians is a booming underground economy in the United States. Millions of animals are imported each year from tropical forests (Collard 2014). Venturing into the realm of pet dealers, I attended major annual events—like the Daytona Reptile Breeders Expo in Florida and Frog Day in New York City. I also visited some of the premier retail establishments in the United States, Fauna on the Upper West Side of Manhattan and the East Bay Vivarium in Northern California.

Owen Maercks, who manages and owns the East Bay Vivarium, started off our interview by bluntly saying, "Many people in the pet trade are scumbags." Pointing me to a popular work of investigative journalism that exposed endangered species smuggling rings, *The Lizard King* by Bryan Christy (2008), he said, "I know all the people in this book. Don't think less of me. My main goal is to breed reptiles and frogs and sell them as pets." But Maercks also echoed the rhetoric of Kevin Zipple's Amphibian Ark: "When a forest is about to be turned into a farm or logged, we have locals running ahead of bulldozers, culling everything out of acreage. Catching stuff in the wild can be an act of salvation."

While scrutinizing some of the businesses involved in the international trade of amphibians and reptiles, I found disquieting examples of loosely regulated enterprises making money off of the reproductive capacities of animals. At the Daytona Expo I interviewed breeders who were using

Figure 15.7
Thousands of leopard geckos (*Eublepharis macularius*) and other animals were offered for sale at the Daytona Reptile Breeders Expo in small plastic containers. Photograph by Eben Kirksey.

do-it-yourself genetics to create "designer snakes" with customized color patterns. Chasing after the elusive genes that encode for pixilated configurations of color, and dreamy calico patterns, they were banking thousands of dollars on the possibility of producing an animal that would become a new unique object of desire. One legendary snake that sold for $100,000 was created by Trooper Walsh, who describes himself in his Facebook profile as "a Government Subsidized Snake and Dragon Farmer" whose favorite activity is "shooting guns." The characters populating the pet trade figure into the fears of Kevin Zipple, who worries that Panamanian golden frogs would be abused if they were to be adopted by citizen hobbyists instead of euthanized.

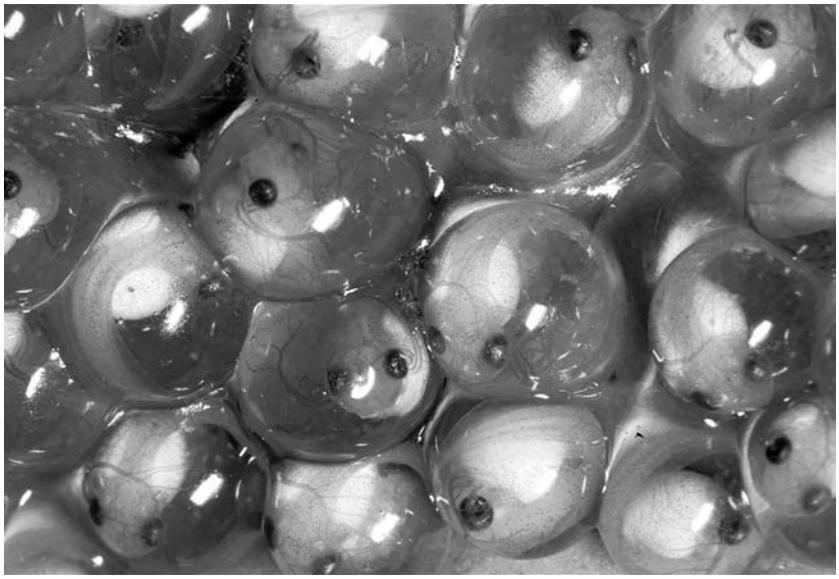
On the sidelines of big conventions orbiting around the sale of exotic and designer snakes, I also spoke with many frog enthusiasts—teachers, children, self-described "computer geeks." A divide separated the social worlds of people who were raising frogs and those who were breeding

snakes. Prized frogs, on offer for prices ranging from $40 to $75, were being sold along with high-end vivariums—living ecosystems on par with the one created for my *Utopia* by Mike Khadavi, designed with the well-being of amphibians in mind. Following the frogs to people's homes, I found dedicated caretakers who were attentive to the needs of their pets and curious about their interests. Trolling through classified ads on Craigslist and other online forums, I came across a website dedicated to the trade of poison dart frogs (*Dendrobates*), which originate from Panama and Costa Rica. Dendroboard.com, "your source for dart frog information," is a community-run website where enthusiasts buy, sell, and trade animals. Self-taught experts also trade tips about animal care, aquarium construction, and veterinary concerns. The posts on Dendroboard reveal a lively virtual community where the genetic integrity of populations, the welfare of individual animals and other ethical issues are central concerns.

While I could not find any golden frogs for sale on the Internet, I found other rare and endangered species being bought and sold as pets. For example, the blue-sided tree frog, a relative of the lemur frog from Costa Rica, has been proliferating in the pet trade in North America and Europe. Within Costa Rica the population of this frog species has declined by 50 percent since the 1990s. Conservationists believe that this sharp decline happened as a result of rampant fungal disease, predation on tadpoles by an introduced fish species, and the collection of animals in the wild for sale in the international pet trade. In 2007, the United States alone was reported to have imported 221,960 frogs belonging to this genus over the previous decade.[16] Once the blue-sided tree frog (*Agalychnis annae*) was formally designated as endangered by the IUCN Red List, the international trade of these animals was banned. Hobbyists in the United States and Europe continued to breed and sell these frogs, even after the ban.

From Germany, Martin Huber posted pictures of hundreds of tadpoles hatching in large plastic vats in his home, giving fellow frog enthusiasts daily updates on Frogforum.net in August 2011. Vendors in the United States were offering adult blue-sided tree frogs for sale at $20 each (figures 15.8, 15.9). Scientists in England were meanwhile breeding blue-sided tree frogs with a closely related species, *Agalychnis moreletii*, to produce unique hybrid offspring (Gray 2011).

Kevin Zipple's Amphibian Ark does not have enough carrying capacity to house blue-sided tree frogs. Against the backdrop of a grim political and



Figures 15.8, 15.9
The blue-sided tree frog has undergone a dramatic decline in protected parks in the highlands of Costa Rica. Currently populations are flourishing in polluted streams around San José, Costa Rica's capital, and also in the international pet trade. Pictures by Martin Huber (15.8) and Seth Kiser (15.9).

economic situation, only fifty species have found a home in his distributed ark, living at institutions that might be able to sustain long-term care.[17] This means that some 3,850 species of frogs with declining populations will not be saved. The Amphibian Ark is fragile, needy of care. Although troubling, the international pet trade may bring animals that have been orphaned by changing ecosystems into homes where they might receive care. Turning animals into commodities for exchange certainly has been one force contributing to the extinction of species. Even so, leveraging the economic value of endangered frogs, despite Zipple's concerns, might be the best way to actualize his conservation goals.

Exchange value and use value were classically part of Karl Marx's account of capital extraction and accumulation. Donna Haraway has added a surprising twist to Marx's classic story of capital with the notion of trans-species "encounter value." Lively capital, by Haraway's reckoning, can generate hopeful coalescences where "commerce and consciousness, evolution and bioengineering, and ethics and utilities are all at play" (Haraway 2008, 45–47). Lively capital is certainly at play in the social world of frog enthusiasts, who breed and feed animals from far-off lands in their own homes. Ethical forms of capitalist enterprise could thus help save the day in an era of mass extinction, when thousands of frog species are living in precarious situations.

Cryopolitics in financially strapped zoos means preserving life in a frozen form—trying to maintain natural forms in an unadulterated state, within complex articulations of technology and culture. Yet, other novel niches have emerged in landscapes that have been transformed by humans. Adopting a livelier approach might involve letting a multitude of people care for endangered frogs in their own homes—in utopias similar to the one that we designed but were unsuccessful in populating. Endangered frogs would then have the opportunity to invade and occupy bubbles of comfort created by people, to generate lively futures for themselves in air-conditioned living rooms, basements, and bedrooms throughout the industrialized world.

Future Promise

While conservation practitioners are crafting piecemeal solutions to reckon with the fact that many species of frogs can no longer live without

protective infrastructures, some scientists are working at the frontiers of their imaginative horizons, searching for a breakthrough cure for the deadly fungal disease that is killing them in the wild. The Smithsonian National Zoo announced in 2012, via a blog post, that it has been inoculating frogs with experimental probiotic treatments in Front Royal, Virginia. "We usually think of bacteria as bad for us, but that isn't always the case," heralded the website: "For us humans, the most common examples of helpful bacteria, or probiotics, live in yogurt" (Smithsonian National Zoo 2012). The blog described how the redback salamander, a native of the Eastern United States, had survived the epidemic fungal outbreak. These salamanders had a diverse array of microbes living on their skin. Researchers speculated that multispecies communities could be a probiotic shield guarding against infection—a thin living bubble of protection. They hoped to discover microbes that could become new companions for endangered frogs, capable of producing chemical compounds with antibiotic (or at least antifungal) properties.[18]

Researchers placed their hopes on one kind of bacteria, *Janthinobacterium lividum*, which produced an antifungal compound called violacein in the lively microbiome on the skin of redback salamanders. When transferred to the mountain yellow-legged frog, an endangered species from California, these bacteria protected the frogs against the fungal pathogen. Captive Panamanian golden frogs, dubbed by the blog as "the poster-child for amphibian conservation," were also inoculated with probiotic bacteria treatments along with pathogenic fungi in experimental trials. While *Janthinobacterium lividum* bacteria initially kept fungal infections on golden frogs to a low level, eventually the probiotic microbes decreased in abundance and the frogs died (Bletz et al. 2013, 813; Baitchman and Pessier 2013, 680). In the face of this failure, I found cautious hopes proliferating in some scientific circles, searching through microbial worlds, coalescing around specific researchers, only to quickly dance away again in other directions. In Panama, I talked to researchers who were carefully testing some 600 kinds of microbes from the skin of other frogs—living figures of hope that might one day enable a multitude of golden frogs to live again in the wild.[19]

Speculation about scientific breakthroughs often fuels messianic thought in the biosciences (Sunder Rajan 2006).[20] "There can be no science without speculation," writes Mike Fortun; "there can be no economy without hype, there can be no 'now' without a contingent, promised, spectral and

speculated future" (Fortun 2001). If messianic speculation in biology is often articulated through money-making dreams and schemes, different political, economic, and ethical forces are at play in hopes pinned on microbes that might help protect endangered amphibians (Franklin 2003). "Utopias, of course, do not last," in the words of Vicente Rafael, "even if their occasional and unexpected happenings are never the last" (Rafael 2003, 422).

Caretakers who maintain fragile forms of life within the Amphibian Ark are laboring in the present, working with scarce resources and following mind-numbing routines in the "now," while harboring dreams of a future that will be transformed by a scientific breakthrough, a silver bullet cure. While holding delicate animals inside uncomfortable architectures of incarceration, many conservation biologists are not jealously guarding their animals. Instead they are imagining a moment when their fragile bubbles might be broken open and the creatures in their care can escape.

Notes

1. The Amphibian Ark, "About Us: Activities," http://www.amphibianark.org/about-us/aark-activities/.

2. Cook, "2010: A Frog Odyssey," posted May 1, 2010, http://pinktreefrog.typepad.com/.

3. Solís et al., "*Hylomantis lemur*," posted January 1, 2008, http://www.iucnredlist.org/.

4. "Scientists Leap to Save Golden Frog in Panama," *Washington Post*, November 7, 2006.

5. The Amphibian Ark, "About Us: Activities," http://www.amphibianark.org/about-us/aark-activities/.

6. "About 30% (1,895) of the 6,285 amphibian species assessed by the IUCN are threatened with extinction," according to the Amphibian Ark website. "There are 6% (382) known to be Near Threatened and 25% (1,597) are data deficient. This means that about 3,900 species are in trouble." http://www.amphibianark.org/the-crisis/frightening-statistics/ (accessed August 5, 2014).

7. An edited video of this speech by Kevin Zipple has been posted YouTube. Amphibian Ark, "Our Planet's Canaries in the Coal Mines," posted July 25, 2011, http://www.youtube.com/

8. Poole, "Husbandry Manual Panamanian Golden Frog," 3–4, www.ranadorada.org.

9. The Panamanian Golden Frogs were technically placed "on loan" from the Maryland Zoo. Only institutions in the Association of Zoos and Aquariums (AZA) were eligible to participate in the lending program, according to guidelines established by the US Fish and Wildlife Service. "This restriction was intended to prevent the protected species from entering the pet trade via captive zoo breeding," writes Vicky Poole, who authored the *Husbandry Manual for the Panamanian Golden Frog* while working for the National Aquarium in Baltimore. "Wild-caught illegal specimens could be 'laundered,'" according to Poole, "under the guise of coming from legal 'zoo stock.'" I conducted a series of interviews with Poole and also consulted her husbandry manual, available at www.ranadorada.org.

10. "Long-term captive management plan is to maintain 30–50 frogs from each bloodline," according to the Poole's husbandry manual. Frogs from some mating pairs "will be undesirables and may displace other more valuable offspring from a desirable breeding, so euthanasia will be necessary to eliminate, or at least reduce their numbers. Be prepared to house offspring indefinitely if allowed to survive." Poole, *Husbandry Manual Panamanian Golden Frog*, 13.

11. Superfund sites were established throughout the United States after the establishment of a government program to deal with places heavily contaminated by hazardous materials and requiring long-term rehabilitation.

12. Ordinary citizens who keep frogs and reptiles as pets now have ready access to the same genetically modified animals that have long been used by zoos and specialized breeding facilities. These adaptable insects are proliferating in biotechnical worlds and emergent ecologies orbiting around the pet industry. See Kohler 1994, 45.

13. Association of Zoos and Aquariums, "Studbooks," http://www.aza.org/studbooks (accessed February 17, 2014).

14. Email from Murphy to Kirksey, "Re: *Atelopus zeteki*," Tue., May 1, 2012, at 8:03 a.m.

15. Anonymous interview conducted by the author, Panama, February 17, 2014.

16. "Blue-sided tree frog (*Agalychnis annae*)," http://www.arkive.org/ (accessed June 1, 2014).

17. The Amphibian Ark, "Frightening Statistics," http://www.amphibianark.org (accessed March 3, 2014).

18. The Amphibian Ark, "Chytridiomycosis," http://www.amphibianark.org (accessed March 3, 2014).

19. In February 2014 I interviewed Myra Hughey at the Smithsonian Tropical Research Institute, who was collaborating with Reid Harris at James Madison University. Their work was still in the early stages at that time.

20. "Biotechnology occupies a messianic space," writes Sunder Rajan, "of technology and of Life linked through capital." Hopes of human patients, who are waiting for new cures, often become entangled with speculation by entrepreneurs who dream about cashing in with new miracle treatments. Money making schemes can nonetheless bring interesting things to life. Sunder Rajan 2006, 123, 149.

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