

Reviving The Dead

As technological advances make genomes more accessible, questions arise over whether to bring back **EXTINCT SPECIES**

NADER HEIDARI, C&EN WASHINGTON

ON MARCH 15, author Stewart Brand stood onstage at a conference in Washington, D.C., and said “De-extinction is an idea worth spreading.”

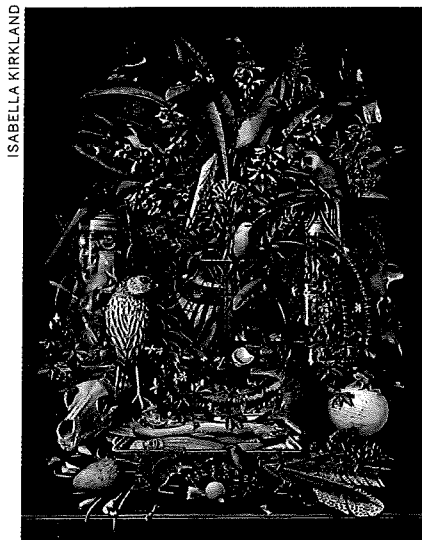
Brand was a co-organizer of TED^xDe-Extinction, an independently organized TED (Technology, Entertainment, Design) event with a focus on efforts to bring extinct animals back from the dead. Similar efforts are under way with proteins (see page 38). The event was hosted through a partnership between National Geographic Society and Revive & Restore, a new nonprofit founded by Brand and his wife, biotech entrepreneur Ryan Phelan.

The talks were not about mere possibilities. Recent advances in cloning, genetic engineering, stem cell research, and other scientific fields have brought humans much closer to that goal. One of the biggest announcements at the conference was the successful creation of a gastric-brooding frog embryo. The frog has been extinct since 1983. Many of the talks dreamed big: reviving recently extinct animals such as the passenger pigeon, adding genetic diversity to existing populations to prevent further extinctions, and even bringing back the woolly mammoth to stomp across the cold regions of Earth, treading upon vegetation to help mitigate climate change.

In a sense, de-extinction is a quest for redemption; one of the speakers went so far as to call it a “moral imperative.” Many animals that have recently gone extinct have fallen because of human factors, such as habitat destruction or overhunting, and de-extinction is a possible way to right those wrongs.

However, the conference wasn't all rainbows and sunshine. The sciences have frequently found themselves in ethical gray areas, and biology, which works with life, has often been a bit darker than its fellow fields. Luckily, it appeared that the speakers at the conference were aware that resurrection can have undesirable consequences. News media covering the conference filled airtime and pages with images from “Jurassic Park” (even though one of the first talks explained why dinosaurs aren't coming back), but TED^xDeExtinction was something much deeper: an intelligent discussion on the ethics, not just the science, of resurrecting dead species.

CONSERVATIONISTS WERE concerned that bringing back extinct species would take resources, which are already scarce, and support away from existing efforts to prevent extinctions. By taking “extinction is forever” off the table, de-extinction could open doors to arguments that an endangered animal's DNA can just be “backed up” and restored (hopefully along with its ecosystem) at a



ISABELLA KIRKLAND

Isabella Kirkland's “Gone” depicts 63 species that have gone extinct since the 1700s.

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Although the U.S. has few, if any, laws that directly pertain to de-extinction, some laws do apply indirectly, providing some hurdles that have to be cleared to return an extinct species to the wild.

Even with the critiques, the speakers agreed that de-extinction is not something that should be banned, far from it. The efforts to bring back extinct animals may find success, and there ought to be a legal and social framework for dealing with that when the time arrives.

The overarching message of TED^xDeExtinction was that conservationists, synthetic biologists, policymakers, environmental activists, and others with an interest in de-extinction need to come to the table and decide how to approach the future cautiously, because technology will not cease to advance. Significant scientific, economic, and social benefits can arise from the pursuit of de-extinction, and perhaps with some guidance and regulation, the negative consequences can be mitigated. It would be best to proceed with cautious optimism.

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later date—if it isn't too expensive, of course.

James Tate Jr., a senior fellow at the Potomac Institute for Policy Studies, said during his talk that while U.S. laws state that the ecology of endangered species needs to be preserved, ecosystems often are knocked to the wayside by economic pressures. He cited the California condor as an example. Even though the species was brought back from the brink of extinction through captive breeding programs, there has been no comparable effort to restore its habitat over that time.

Henry T. Greely, a professor at Stanford Law School, brought up the point that besides the suffering and death that has been the consequence of attempts to clone or resuscitate a species—many cloned animals have complications and die quickly—an ethical problem comes with reviving extinct animals that have no habitat to return to. Bringing back a species only to keep it in a lab or in captivity seems cruel, and that appears to elucidate the real problem. The environment, not just the wildlife, needs to be restored.

There is also the fear that the revived species would wreak havoc on current organisms and environments. The revived species could become invasive or serve as vectors for disease, becoming risks to human and animal health. Great care needs to be taken as to which recently extinct species should be revived.