Scientists try to bring Australian ‘tiger’ back from extinction

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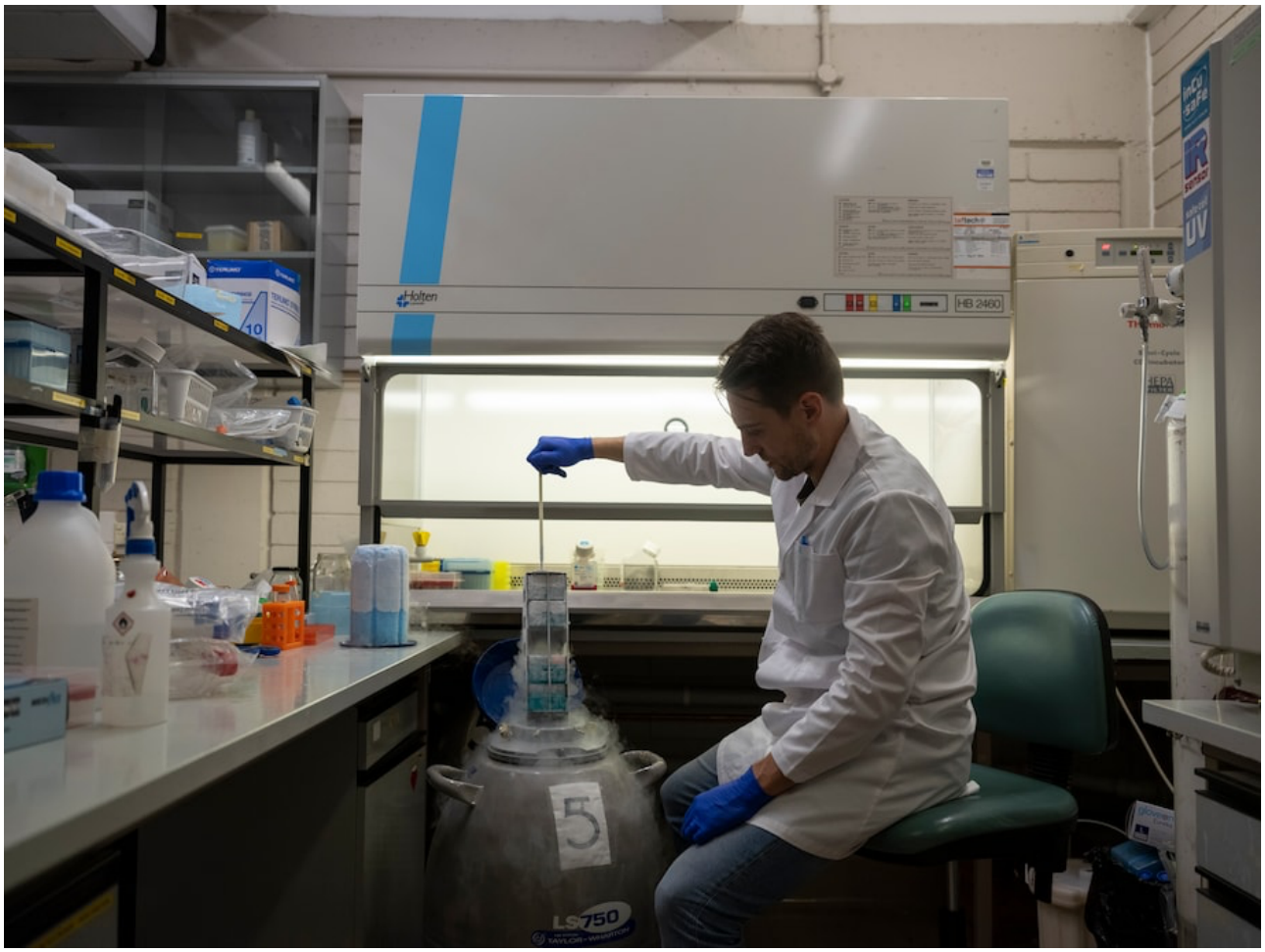

Axel Newton, a research fellow at the University of Melbourne and a founding member of the Thylacine Integrated Genomic Restoration Research lab, lifts cryogenically frozen human, mouse and marsupial cell lines from their liquid nitrogen storage. (Alana Holmberg/Oculi for The Washington Post)

MELBOURNE, Australia — The scientist reached into an enclosure in the biosciences building at the University of Melbourne and pulled out a dunnart — a mouse-sized marsupial with huge, inky black eyes. It latched its teeth onto developmental biologist Stephen Frankenberg’s finger. Frankenberg put it back, and it scampered into its home of egg cartons and native grasses.

The tiny creature seems an unlikely candidate for closest living relative of

an apex predator. But it could be key to bringing the thylacine — also called the Tasmanian tiger — back from extinction.

The enclosure is part of the university's newly established Thylacine Integrated Genetic Restoration Research (TIGRR) Lab. A team of genetic scientists led by biosciences professor Andrew Pask is attempting to make the concept of "de-extinction" a reality. Over the coming decade, they plan to use gene editing to turn a dunnart cell into a thylacine cell and bring the long-dead creature into today's world.

The goal invites an obvious reference. Pask doesn't mind.

"I love Jurassic Park!" he said. "I love it." He keeps a boxed figurine of John Hammond, the character in the 1993 film who creates the ill-fated park for de-extincted dinosaurs, in his office.

Critics call de-extinction projects expensive follies that distract from the real work of conservation and that could have unintended consequences. But Pask, unlike the fictional Hammond, says he has a conservationist's ethos. Australia has the fastest rate of mammal extinction in the world, driven primarily by invasive species such as foxes and feral cats, and changing wildfire patterns. He hopes the scientific advances that will be necessary to restore the thylacine will help endangered animals still hanging on to survival.

Acquittal in Aboriginal town stirs ghosts of Australia's last massacre

"When people say, 'Didn't we learn anything from Jurassic Park?' — well, it's very different bringing back a velociraptor to a thylacine," he said.

Pask's favorite vanished species was native to the island of Tasmania. The thylacine looked somewhat like a small wolf with a distinctive striped back, jaws that opened 90 degrees and a pouch on its belly, like a kangaroo's, for carrying young. The last known individual, named Benjamin, died in a

Hobart zoo in 1936.

Here's the plan to bring it back: First, turn dunnart cells into thylacine cells using gene-editing technology. Then use the thylacine cells to create an embryo, either in a petri dish or the womb of a living animal. Implant the embryo into a female marsupial such as a quoll, and watch the quoll give birth to a thylacine baby. When the baby is old enough to leave the quoll pouch, raise it into adulthood. Repeat and establish a healthy population, with the goal of releasing thylacines into the wild.

In Australia, slot machines are everywhere. So is gambling addiction.

"It is certainly feasible," said Owain Edwards, Environmental Synthetic Genomics group leader at the Commonwealth Scientific and Industrial Research Organization, who is not involved in the project. "Absolutely. What they're proposing to do, can be done. What isn't clear to anybody yet is: What exactly will result from it? Because it will never be a pure thylacine."

Gene editing is different from another process with a foothold in the public imagination — cloning. Unlike in cloning, the cell that resulted from the TIGRR Lab work would not contain an exact copy of a thylacine genome. It would be a part-dunnart, part-thylacine hybrid. "I don't know whether it's going to be 99 percent thylacine or 99.99 percent thylacine or 78 percent thylacine," Pask said. "We will be able to bring back something." The approach is similar to a U.S. effort to de-extinct the woolly mammoth by editing elephant DNA.

'I killerated old Paddy': Twist in Outback mystery, but no arrests

Paul Thomas, a molecular biologist with the University of Adelaide who is also not involved in the TIGRR Lab, has doubts the extensive genome editing that would be required — he is reluctant to call it a de-extinction — will be feasible within the next decade. The dunnart and thylacine

genomes have "probably hundreds of thousands — probably millions — of differences," he said. "It's an interesting approach, but it's certainly going to be a long and difficult project."

Elsewhere in the lab sat a reminder of the impact humans have already had on Mother Nature: the cane toad. Brown and wart-covered, four poisonous individuals stared out of their tank with a torpidity that belied the havoc their species has wrought.

Koalas are getting harder to find. Scientists in Australia are on a quest to uncover a hidden population.

The cane toad was introduced to Australia in the 1930s with the idea that they would eat a sugarcane-devouring beetle. Their presence had "no effect at all" on the beetle, Frankenberg said, but they devastated the native animal population. There are now about 200 million cane toads in the country — so many that, in the competition for food and the absence of other predators, they have turned cannibalistic.

Now scientists hope new technology can remedy the mistake. One of Frankenberg's offshoot projects is an attempt to edit the DNA of native animals to develop resistance to cane toad poison. He's starting with the northern quoll, a cat-size marsupial.

"Species in South America that have co-evolved with the cane toad over millions of years are genetically resistant to the toxin," he said. "And it's known what gene is responsible for that."

If the gene-edited quolls are not affected by the poison, they are more likely to thrive in the wild. "And then they're natural predators of the cane toads," said Gerard Tarulli, another developmental biologist in the lab.

Genetic material from museum specimens could be added to a wild gene pool to increase its overall health. The lab plans to develop a biobank of

frozen marsupial cells so individuals could be cloned and released. Another project would use a controversial technology called gene drive: editing the DNA of unwanted species such as foxes so they produce only male offspring.

“There's a lot of power in this technology,” Pask said. “And it's stuff we just don't even have the basics figured out for marsupials yet, but we'll do it in this project.”

The idea of meddling with the DNA of wild animals to save them does not sit well with everyone. Scientists, ethicists and environmentalists have raised objections to the idea of unleashing gene-edited creatures — including those that used to be extinct — without fully understanding the potential consequences. Cam Walker, a spokesman for Friends of the Earth Australia, says gene editing introduces new risks to ecosystems when people should be focused on preserving the natural world.

“We do not support gene editing in conservation,” he said. “The entire process involves many random events whose end results cannot be predicted.”

Around the TIGRR Lab, a favored slogan is “turning science fiction into science fact.” Down the hall from Pask’s office, doctoral student Tiffany Morelande pipetted green droplets of cell material from a mouse skull into a machine, to compare it with the genetic workings of a thylacine skull.

Nearby, Tarulli sat behind the screen of a powerful, giant microscope in its own closet-sized room, watching cells interact with reproductive hormones. Downstairs, Frankenberg checked on the dunnarts. A molecular biologist named Axel Newton, in a white coat in another section of the lab, said he still can’t quite believe he could be taking the first steps toward bringing an animal back from extinction. He added nutrients to a collection of cells to make them grow. “This is how it happens,” he said. “You start here.”