Extinction echoes Jurassic Park, with a Pleistocene epoch backdrop.

Multiple spoiler alert!

In the classic film Jurassic Park (JP), disasters unfurl at a theme park populated with dinosaurs cloned from reptile DNA in mosquitoes fossilized in amber, with modern frog DNA filling in gaps.

Douglas Preston’s new novel Extinction—really De-extinction—riffs on the 1993 Steven Spielberg epic, substituting in genetic material from a half dozen mammals from the Pleistocene, circa 2.58 to 11,700 years ago. The animals were cloned from DNA in tiny, preserved ear bones, and doctored a bit.

The resulting animals roam a resort nestled into the remote Colorado Rockies, thanks to biotech company Erebus. At sundown, guests gather at a panoramic window in the lodge’s lobby to watch the behemoth herbivores wander to a stream, the mammoths especially beloved.

But unlike Jurassic Park’s out-of-control carnivores, the Ice Age bestiary boasts only mellow vegetarians: Irish elk, giant beavers and ground sloths, glyptodonts (armadillos), and woolly rhinoceri and mammoths. The rhino is about the size of a Trader Joe’s!
Late Pleistocene in northern Spain, by Mauricio Antón. Left to right: wild horse; woolly mammoth; reindeer; cave lion; woolly rhinoceros

But there’s a secret seventh species. *What can it be??*

Like Jurassic Park’s Ellie, the paleontologist who sticks her arms into dino poo, *Extinction* has Frankie Cash. She’s one of a cast of law enforcement and forensics folks investigating the disappearance of honeymooners Mark and Olivia, camping at the resort. The tale opens with their shredded tent and two huge pools of blood, no body parts in sight.

And the missing bride is/was pregnant.
Markâ??s billionaire father funded Erebus, based on the Erebus Project, which chief scientist Marius Karman began 16 years previously â?? enough time for lab-initiated mammals to have matured. The cloning and genetic modification labs are tucked inside three mountains near the lodge, along with freezers stuffed with ancient animal parts.

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Neander DNA in us

Like Jurassic Park, which was based on the 1990 novel by Michael Crichton, Extinction is a rollicking ride with classic good guys, bad guys, and chases. Also like its predecessor, the Erebus facilities are destroyed at the end. Thereâ??s even a hapless film crew filming near the lodge who are attacked like the newlyweds, akin to the T. rex gobbling the attorney sitting on the crapper in JP.

Frankieâ??s bemoaning â??Thatâ??s the problem with science. If something can be done it will be done, no matter how dangerous,â?• echoes Jurassic Parkâ??s mathematician Ian Malcolm bewailing, â??your scientists were so preoccupied with whether or not they could, they didnâ??t stop to think if they should.â?•

Of course! I wanted to read Extinction the second I read about it.

(Iâ??m eminently qualified to review the book, because, according to 23andMe, I harbor more Neanderthal DNA than 85% of the modern human population. But itâ??s a smidgeon.)

The bookâ??s only scientific error (besides â??fertilized embryoâ?• and â??they were people, not animalsâ?•) is that weâ??re NOT â??two to three percent Neanderthal,â?• as chief scientist Marius Karman authoritatively states in the book.

How can that be, given that we share about 1.2 percent of our DNA sequence with chimps? The correct metric is percent shared ancestors. Whatever oneâ??s Neanderthalian genetic burden, some of the forebears of those of us with European or Asian ancestry bred with Neanderthals. And so short sequences of N-DNA remain in our chromosomes. And I have more than most.

From cultists to cannibals

Who, or what, killed the newlyweds? The volume of blood spilled in the minute it took someone to answer their screams indicates that they literally lost their heads.

Who did it? Was it a cult of depraved off-the-grid mountaineers, perhaps not unheard of in the wilds of the Colorado Rockies?

That suspicion deepens when Frankie feels watched in the woods, then spies fleeting erect figures festooned with tight layers of leaves and twigs and smelling oddly of a mixture of excrement and bile. The
beings are expert at camouflage, and also, the team later learns, at twisting off a head like opening a large bottle of Dr. Pepper.

And they eat people.

A chapter is devoted to cannibalism, complete with a reference to Hannibal Lecter’s fava bean fetish and the famous Fore people of Papua New Guinea, whose cannibalism ritual spread the prion disease kuru.
I hadn’t known the six classic signs of cannibalism:

1. Cut marks on joints, to separate limbs
2. Scrapes along bones, to strip out flesh
3. Carved or pounded spongy bone, to remove marrow
4. Anvil marks on long bones, to extract marrow
5. Polished bone ends from boiling
6. skulls placed upside down into the fire to roast the brain inside the cranium and then broken open.

Another stereotype sets the team in the right direction – an old miner with detailed maps of the innards of two mountains in the area, plus a third that Erubus conveniently forgot to mention.

They’re smart!

Indeed, inside that third hidden mountain is a huge spoiler alert – a community of Neanderthals of all ages. The children go to school, play musical instruments, discuss philosophy.

Adults dress nattily in L.L. Bean, Nikes, and Patagonia. They only seem to differ from us in their faces – broad and thick, with long, thin mouths, heavy brows, prominent cheekbones, and almost no chins.

Like the smart simians Zira and Caesar of the Planet of the Apes, some mountain-trapped Neanders are clever. But the first experiments to clone and genetically modify them led to some who were misshapen and freakish, with distorted features and twisted bodies.

Eventually, a few mutant Neanders escape and, among other things, steal TNT from the movie set and eventually blow up the labs and lodge.

But before the grand finale, the escapees quietly traipe and flit through the woods, disguised and stinky, eating newlyweds and such, their lairs littered with dismembered human bones. Their charismatic leader is the tall and striking Joey, cloned from a cell of the famous ancestor who occupied a cave in France 57,000 years ago.

Joey had a pale, bloody face of freakish ugliness, with massive brow ridges and a giant grimacing mouth full of huge flat teeth, the man’s long, blond hair in braids whipping about in the wind like some crazy Viking’s. I envisioned a bleached blond Jacob Chansley, the horned headress-wearing, fur-bearing, tattooed invader of the US Capitol on January 6, 2021.
But Joey is smart, insightful, and articulate, so much so that Karman explains his origin like a proud papa. “I created you â€¦ from dust. Each one of you came from dust drilled from secret pockets of DNA trapped in ancient bones.”

Stockholm syndrome

In a weird twist on Stockholm syndrome, the well-meaning Karman becomes attached to his de-extincted companions, growing especially close to a 12-year-old who is a skilled violinist.

“Neanders understood and loved music as much as Sapiens. The two decades of surprises had shattered every preconception of what Neanders were like or what they could do,” Karman notes, coming to prefer the company of the Neanders to his own species.

Indeed, the resurrected Neanders are better at running, hunting, tracking, and surviving the cold, with a far superior sense of smell compared to Sapiens. At the same time, they lack the violence, deception, lying, and cheating of the supposedly superior human. Karman taught them to read, paint, sing, play games, and even use computers and technology.

Until Frankie and her team discover the hidden lab and Neanderthal settlement deep in the mountain, Extinction detours into the inevitable chase scenes. Good guys chase bad guys, averting obstacles and sustaining gruesome injuries, amid a few deaths.

Bad things happen to the resurrected giant mammals too. The second sign of a real threat, after discovery of the headless newlyweds, is the grisly death of baby mammoth Tom Thumb. His family, genetically modified to lack empathy, do not protect him. And how could other harmless herbivores have torn the baby apart? Poor Tom Thumb had had his aggression genes removed and his nascent docility pre-programmed. He never even tried to run away or fight back.

De-extinction is plausible!

Biotechnology has come a long way from the cloned dinos of Jurassic Park. The Neanderthals of Preston’s imagined Pleistocene were engineered using a clever combination of three key biotechnologies.

Cloning

Dolly, the sheep named after the country singer, originated as a cell from the breast of a six-year-old ewe. She was born on July 5, 1996, the first cloned mammal.

Cloning starts with a somatic (body or non-sex) cell cultured in a soup of growth factors, hormones, transcription factors, and nutrients. The brew coaxes cell division and development to unfold, and after sufficient time years or decades – the animal is mature.

It isn’t necessary to know the genome sequence of an animal to clone it. Dolly predates the start of the sheep genome project.
in 2002, which was completed in 2016.

Cloning the Colorado Neanders had been going on for 20 years, and they live 25 to 40 years. The dinos of Jurassic Park must have been cloned at least a decade prior to have reached adult size and proportions by the time Ellie’s mouth dropped open observing the majestic brontosaurs chomping trees.

**Genome sequencing**

Svante Pääbo, director of the Max Planck Institute for Evolutionary Anthropology in Leipzig, and his team first sequenced the genome of a Neanderthal in 2009, for which he won the 2022 Nobel Prize.
Then in 2012, stem cell technology and genome sequencing converged, leading to the possibility of de-extinction – bringing back flora and fauna. Harvard’s George Church (the model for Marius Karman) led a meeting about de-extincting animals, beginning with the carrier pigeon. Attention rapidly turned to restoring the popular woolly mammoth.
CRISPR gene editing

First came cloning. Then genome sequencing. Then imprecise methods of adding genes that would insert willy-nilly into a targeted genome, aka gene therapy. CRISPR brought precision to altering genomes.

Early in 2012, Jennifer Doudna and Emmanuelle Charpentier published their first paper introducing the gene-editing tool CRISPR, for which they won the Nobel Prize in 2020.

Putting it all together

Dr. Karman ticks off the recipe for recreating a woolly mammoth.

- Compare the genome sequence of a preserved mammoth cell to that of an Asian elephant and identify the differences.
- Use CRISPR to cut and paste select mammoth DNA sequences into the genome of a cell from an ordinary elephant, while removing their counterparts in the elephant genome.
- Modify variants of genes encoding proteins that promote or diminish a particular trait or behavior, such as aggression, intelligence, dexterity, or speaking ability.
- Remove fertility genes, to counter mutations that CRISPR may induce.
- Clone. After a few cell divisions, transfer the ball of cells into an early embryo with a mixed genome of elephant and mammoth to the uterus of an elephant.
- Wait 18 to 22 months, and welcome a baby mammoth.

Each such beast costs between $12 and $60 million.

While the hairy giants of Erebus were created to entertain tourists, Karman had an ulterior motive using select Neanderthal genes to enhance human babies. The camping couple from the opening scene were expecting, and had signed up to genetically boost their future baby presumably not knowing the source of the genes.

The eugenics intent

As mathematician Ian Malcolm said in Jurassic Park, life finds a way. Even the most established genetic manipulations can have unexpected results.

At Erebus, CRISPR inadvertently removed the genetic basis of empathy when recreating Neanders. That’s why some of them have a fondness for ripping off human heads and cooking the brains in the skulls, like baking a quiche.
As in Jurassic Park, the genome-tinkerers didn’t know what they didn’t know. We had no idea they would create a religion out of taking back the earth from Sapiens. And in the early days, genetic errors led to some mental issues. I refused to let those unfortunates be put down, said Karman. So, he confined them inside the mountain and a few escaped.

The novel ends with Karman fiercely defending his eugenic intent for the offspring of the wealthy couples who buy into the genetic manipulation, to the tune of $12 million:

“They are not ‘designer babies,’ Karman erupts angrily, evoking tales of New York City parents shelling out to register their fetuses in the top preschools.

We’re guiding our species to a brilliant new future. No more sickness, genetic disease, obesity, addiction, or cancer. No more ugly, weak, or stupid people. No more depression or mental illness. These brave young couples are phase one in the plan, and their fees are financing our vital work! The megarich will pay anything to have perfect children.

But genetics is never an infallible crystal ball. The eldest Neander-enhanced children, Karman adds, are already nine years old, and it appears there may in fact be issues with regard to a propensity toward violence.

I sense a sequel?

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