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Buried

Rachel Denham-White
Curtin University

Nuclear waste disposal is an environmental issue that forms part of our oncoming climate crisis, but uranium itself will not decay for thousands of years. In the nuclear disposal locations currently being built across the globe, notably in Carlsbad, New Mexico with the intended completion date of 2038, the question remains: How do you indicate the danger of nuclear waste to the upcoming several generations? Scientific diagrams, nuclear trefoils, chemical symbols and even the written word may be obsolete within the next couple of centuries, so how should today's science communicate with an unknowable future? What does the universal "Keep Out" or "Danger" sign look like? This creative non-fiction piece weaves together research and personal prose, questioning the undoubtedly nihilistic task of keeping the nuclear disposal sites secure and undisturbed, when we have no way of predicting the course of history, human or para-human evolution and scientific understanding.

East of Carlsbad, New Mexico, in a landscape of empty, cracked desert, a hole is being dug. It is currently 910 meters wide and over 650m deep.

A similar excavation can be found in the Olkiluto Island in Western Finland, where a tunnel more than half a kilometre deep has been bored downwards into the rock.

This hole is called Onkalo, which is the Finnish term for "cave" or "cavity" or sometimes "hiding place."

(Thousands of years from now).

I walk through a desert, parched, salt-scrubbed earth baking under the unrelenting sun. This land is unfamiliar to me. But it undeniably cherishes life, as I tread my way through dotted spots of greenery with small cacti and shrubs pressing up from the shifting, wavering ground.

Then I reach a desolation.

Empty sand. Bare gravel. A wall of jagged earth blocks my path.

I scale it and see long sheets of black stone stretching out before me, sucking the breeze from the air and throwing searing heat back into my face. I reel from each burning punch. The temperature makes breathing almost unbearable, but I press on. I have to know what happened here.

The black stone ends and then the spikes begin. Jutting thorns and knife-like spires press up from the ground at sharp angles, painting a tangle of black scribbles over the landscape, rising to pierce the wide sheet of blue. It could be a vestige from some ancient metal forest, maybe a broken sea of circuitry and wiring made by long-dead juggernauts? If I listen, can I hear a groaning message as the wind whistles

between the spikes? My mind does not know how to wrestle meaning from this brutal environment. But still I fight my way through.

The next wall is made of granite and towers five meters above my head. A small, narrow opening beckons me to enter, and I make my way through the concrete city. Dark, square blocks form neat rows across the salt flats, studded with irregular polygons of stone. As I near the centre, I start to find ancient carvings. Each one is the face of an eradiated being, with hollow pits for eyes and mouth drawn down in a gaping ecstasy that could be a scream.

It cannot be a warning to stay away, surely? *Surely!* Why would the forebearers leave it all out in the open, just begging for someone to find? It must be a grave. Or a memorial to some terrifying cataclysm, long since passed. I step tentatively, unwillingly, yet deadly curious to know what bones might crowd together under my feet. The shade morphs into silhouettes of mangled bodies. The spikes are far behind me, but I still hear screaming on the wind.

Cubes tower above my head, blocking out the sun but trapping me in a vice of heat. They are crowned with a stone obelisk, reaching sharpened fingers towards the sky. Everything is vast, geometric, sterile, and formidable, but undeniably made.

I wonder what reasoning led to a place of such hatred.

We are going to tell you what lies underground, why you should not disturb this place, and what may happen if you do.

If you asked me what substance lasts forever, if I was in a whimsical mood, I'd say "love."

On any other day, I'd say "uranium."

It's been almost 20 years since the official end of the Cold War, and even if we'd like to think this period of history is over, the nuclear weapons made in this time still have nowhere to go. Uranium can be harnessed to cause cataclysmic destruction, but it can never be destroyed. The average fuel rod of enriched uranium and zirconium alloy will stay burning hot, unstable, and toxic for millennia after it leaves the reactor of a nuclear power plant.

How to dispose of radioactive matter? Bury it beneath the ocean floor? Shoot it into space? Scream at it, cajole it, kick it out of sight, forget about it? It seems a quiet grave is the only solution. For in New Mexico and Finland and Belgium and other secure locations around the globe, plans are being made for how to entomb uranium in the ground and leave it to decay. But instead of the sweet, swollen bloat of a corpse as it gives back to the earth, uranium will exist unchanged. Maybe one day the atoms might have broken down enough to release harmless radon gas, but that won't happen in our children's, children's, children's, children's lifetimes.

The Onkalo facility in Finland is meant to last for 100,000 years. I picture this site as a live burial, with a cadaver that can ceaselessly destroy even a myriad after its death.

This site was known as the WIPP (Waste Isolation Pilot Plant Site) when it was closed in 2038 A.D.

I first became invested in the disposal of nuclear waste when I picked up Robert McFarlane's book *Underland: A Deep Time Journey*. I immediately skipped ahead to chapter 12, past thousands of years of cave paintings and Paris catacombs and dark matter, to read 'The Hiding Place,' which led me to the New Mexico site in the Carlsbad desert. This remote location is intended to store large quantities of transuranic matter: materials that have had brief contact with live uranium. These are only by-products of nuclear weaponry, but still, these objects can remain harmfully radioactive for decades. Beneath the desert, 800,000 fifty-five-gallon drums full of clothes, tools, buttons, gloves, and personal protective equipment are being stacked in the underground containment facility.

That is only step one of the disposal. All across the USA, the defence-generated nuclear sludge and runoff from the last fifty years is being transported to Carlsbad and poured into 2-meter-high steel and lead-lined canisters. These substances are so toxic that an adult human would be dead in three to four hours if standing unprotected in a room with them. Once all the nuclear waste is safely sealed, these canisters will be stored in huge round holes bored into underground chamber, and finally barricaded behind the stacked barrels of transuranic waste.

Underland was published in 2019. This is all happening now.

And once every last container of uranic and transuranic material is safely hidden away, the tunnels will be collapsed. Over thousands of years, the salt from the desert will eventually leak through the ceiling and seep into the canisters, hopefully neutralizing the spread of the radiation. Hopefully.

The waste was generated during the manufacture of nuclear weapons, also called atomic bombs.

Parasites or bacteria multiply within a body to feed, and viruses hijack our DNA to create new extensions of themselves. I'm capable of sympathising with a tapeworm due to its undeniable motive to survive, but uranium is not living.

Uranium is the closest thing I can compare to a Lovecraftian entity that exists on this Earth. It will literally unknit you.

If exposed to ionizing radiation, your white blood cell count will drop to almost zero. Then uranium atoms hammer through your body, smashing the fragile, spiralling webbing of DNA. Organs fail and the stomach lining begins to break down, leading to a terrifying risk of septicaemia as your gastric tract opens into the rest of your internal systems. The radiation marches on, undeterred by drugs or antibiotics, because now your blood is spilling out of dissolving veins and arteries. Eventually, your very skin begins to melt.

If nothing else, uranium forces you to see your body as nothing but a sack of loose meat, held together by a quickly deteriorating sleeve of perforated flesh. A living

corpse, that gets to witness its own decomposition in real time; staring into the thriving metropolis of decay.

We believe that we have an obligation to protect future generations from the hazards that we have created.

This obligation will last 100,000 years. How to even start?

For the first century after its intended completion in 2038, the WIIP site will have 'active institutional controls' in place. This means guards will be posted around the facility to ensure there is no digging or drilling, and to keep unsuspecting travellers away. But this is not a long-lasting solution, so eventually, the site will be abandoned and left up to 'passive institutional controls.' Which begs the question: How do you universally communicate the nature of this terrible stretch of land to the future?

The minds behind this project are the Human Interference Task Force, created by the US Department of Energy and made up of scientists, social psychologists, nuclear waste disposal experts, linguists and science fiction writers. Their proposed first step was to construct thirteen layers of solid concrete blocking the passages into the containment rooms. Next come a series of underground anterooms filled with granite steles, engraved with warnings written in the six universal languages of the United Nations, as well as Navajo; the most widely spoken Native American language in the US.

Above ground, the passive controls will be implemented through 'hostile architecture', made up of buildings designed to be deliberately difficult, threatening and uncomfortable to navigate. The sealed containment site will be crowned with the jutting 'Landscape of Thorns', the burning 'Black Hole' of heat-repelling stone, and the massive 'Forbidding Blocks.' Spikes, monoliths and massive granite cubes will extend out for miles out in every direction, to repel any curious explorers for the next 100,000 years.

I try to maintain a positive outlook, but it all seems a bit hopeless to me.

If nothing else, the sheer human hubris to presume that language will remain static for the next thousand centuries leaves me with a bitter taste in my mouth.

The Rosetta stone is one of the earliest examples of written human language, and it is just over 5,500 years old. Today, perhaps a thousand people in the world can understand cuneiform or ancient hieroglyphs. How can we even fathom a way to correspond with the next 1000 years, let alone ten times that amount? Or a hundred times! Written language cannot be considered a guarantee of the future, so what's left? How to express 'danger' over an unknown chasm of time?

The nuclear trefoil? A nice idea, but it could only take a few centuries before this symbol drops out of all understanding, until it becomes merely a black and yellow flower housed within a bordered triangle.

The pictogram feels like a long shot. Maybe the future humans or alien beings who stumble across this site will laugh at the ungainly, bipedal stick figures falling down pits and shattered by cartoon explosions. These strange little cave paintings could be showing some sort of uncultured animal. Or pet. Or a children's tale inscribed on the wall of this underground cavern.

There was even the idea to carve Edvard Munch's 'The Scream' into the Forbidding Blocks, cause what's more horrifying than a slack-jawed, emaciated nightmare creature leering out at you, as if trapped in the rock? But then again, who's to say that won't be beautiful 10,000 years in the future?

A fairytale might be one of the only options left. Like the seeds of an apocryphal story, the Human Interference Task Force has been dreaming up ways to pass the knowledge safely through the next millennium: in art, music, myth, and legend. Some suggestions have included genetically modifying flowers or breeding domestic cats to change colour in the presence of high radioactivity. This 'danger' colour could then be deliberately introduced into commissioned art and literature as a sign of imminent peril, hopefully conditioning the future to stay away.

Another suggestion was to introduce a community of "atomic priests." These individuals would be sworn to live near the site and pass along the generational message as a religion, singing hosanna's and Ave Maria's in the name of their great Lord whose name is Ur Ran Eye Em.

But these current thinkers still have to prepare for the worst possible outcome: for their messages being misinterpreted or bastardised, or just plain ignored.

A crumbling ruin suggests something old and magnificent but rendered safely dead by time. What if leaving such a grandiose message above the nuclear site openly invites the future humans to come and explore? The Hernan Cortez's, Howard Carter's, Alan Quatermain's, Indiana Jones's and Rick O'Connell's kept digging, no matter what curses were thrown at them. Who's to say our descendants won't excavate for treasure in the Landscape of Thorns, ignoring the "Here be monsters" printed on the edges of the map and carved into every granite tomb.

Any intelligent society of the future will be curious, and, in this case, curiosity *will* kill the cat.

In my mind, I think of the New Mexico site as a real-life R'lyeh, a nightmare-corpse city that was "built in measureless aeons behind history." If the high priests of the future can convince their flock that a great unknowable 'something' lies dreaming below the fragile Earth's surface, then maybe it'll never be disturbed.

This message is a warning about danger.

Across the board of climate activism, from the United Nations to Extinction Rebellion to the Intergovernmental Panel on Climate Change, the point of no return for the Earth's devastation is often estimated at 2040. The WIIP site is scheduled to be sealed in 2038. Something in me keeps asking "What's the point?"

Climate change for me feels like the buzzword of the last decade. But we can't ignore that we are facing an oncoming global apocalypse, and my generation is the one that will have to face it.

Climate grief is an interesting series of emotions. Guilt and shame intermingle with ruefulness, as well as a perverse, mothering need to 'kiss it better.' Evasion and denial join the mix. "It wasn't me! I didn't do this!" But don't I make everything on the Earth worse by existing? Do I even bother to mourn if it feels like humanity won't make it to the next century?

Then again, grieving for our “dying Earth” as a concept feels a little disingenuous. No matter what scratches humans make on its surface, the 4.5-billion-year-old rock will never truly die by our hand and can probably survive anything the universe can throw at it. The 10,000 years after the extinction of the dinosaurs is pretty solid evidence. We’re not crying for the Earth itself, but for our inevitably unsustainable way of life.

So, eco-nihilism is pointless. Why not eco-positivism?

In a certain light, the nuclear waste disposal project *can* appear as the ultimate signifier of human cooperation. We can work together against a common adversity: the unfathomable uranium atom. Bringing great minds together in an elegiac glorification of our own exceptionalism. Isn’t it great that we’re all cooperating!

But I see no joy in this vast graveyard.

Maybe that’s why the New Mexico site haunts me so deeply. No matter what safe truths we try to spin around its reasons for existing, this burial mound will remain static. An ultimate marker of shame. A grave testament to the Anthropocene.

Unlike the Landscape of Thorns, once the *Onkalo* burial chamber in the Olkiluto woods in Finland is sealed, it will be left to nature to dispose of. The Finnish forest will grow over this vast chasm, until natural landslides and wildfires and oncoming Ice Ages have completely erased all markers. It may take a millennium, but is this the best, no, the safest way to credit humanity’s long stream of mistakes? By letting them drop out of all knowledge.

However, as of 2019, at the Onkalo site there is a grey, metallic plaque besides the cavernous hole. It reads:

“This place is not a place of honor... no highly esteemed deed is commemorated here... nothing valued is here. What is here was dangerous and repulsive to us. Sending this message was important to us. We considered ourselves to be a powerful culture.”

I don’t read this message as speaking to the future. I think it’s for us, right now. And I really like the use of the word “We.” It gives a sense of group accountability, that the people who built this site have already accepted the inevitable fall of our civilization.

Instead of the talk of ‘protection’ and ‘obligation’ and the consequences of disturbing the containment facility, placing the blame squarely on the unknowable entities of the future, the plaque at Onkalo is an apology. To me, it says “We did this. We let ourselves down when it counted. So this is our effort to heal.”

Under vast and trunkless legs of stone, the walls declaim a warning. The messages are engraved in English, French, Spanish, Russian, Chinese, Arabic and Navajo.

If the coming observers can read it, they will see:

We are going to tell you what lies underground, why you should not disturb this place, and what may happen if you do.

This site was known as the WIPP (Waste Isolation Pilot Plant Site) when it was closed in 2038 A.D.

The waste was generated during the manufacture of nuclear weapons, also called atomic bombs.

We believe that we have an obligation to protect future generations from the hazards that we have created.

This message is a warning about danger.

We urge you to keep the room intact and buried.

Do they dig?