

Sonica Botanica: Stories and Sounds from the Gardens

Episode 6: Australian Drylands

March 2025

[00:00:00]

SALLY MCPHEE: You are listening to *Sonica Botanica, Stories and Sounds from the Gardens* created by Patrick Cronin and Royal Botanic Gardens Victoria. We acknowledge the Traditional Owners of the lands on which the Gardens are sited, and this episode was created, and we pay our respects to Elders past and present. In this episode, you'll hear from scientists, a poet, horticulturists, and visitors to the Gardens. We invite you to explore the Australian Drylands and Eucalypt Lawn as we reflect on change. Changes to plants, to people, and to landscapes.

[00:00:40]

JEANINE LEANE: *Yiradhu marang. Yuwin-dhu Jeanine. Wiradjuri yinaa Marrambidya dhi.*

My name is Jeanine Leane, and I'm a Wiradjuri poet, writer and academic from the Murrumbidgee River in southwestern New South Wales, near Gundagai.

[00:01:05]

I'd like to acknowledge I'm talking today from the lands of the East Kulin Nations, where I've had the privilege of living and working for the last nine years, and acknowledging sovereignty never ceded, and paying my respects to Elders of the Kulin Nations past and present.

I'd like to share with you a poem that I created for *Seeds of Hope* for the Australian Drylands.

[00:01:33]

“We each have seeds of hope and seeds of fear inside us. We choose the ones we will nurture and grow.” - *Mandaang guwu*. Thank you.

MICHAEL-SHAWN FLETCHER: The Australian landscape, like all landscapes, has changed at various rhythms through time. There was a Greek philosopher, Heraclitus. One of his quotes was that it is in change that the Earth finds rest. Basically, the constant state of the Earth is one of change.

[00:02:07]

I'm Professor Michael Sean Fletcher. I'm a Wiradjuri man. I'm a biogeographer at the University of Melbourne.

Biogeography's the study of the face of the Earth, the processes that have led to the biota communities we have both in space and through time.

So, we'll drill down, sometimes we'll use a geological drilling apparatus that can punch into the earth, tens and tens of metres, other times we'll float on a very deep lake and send down chambers and fill them with sediment.

[00:02:33]

And when we pull this sediment or mud up, it's essentially like a book. A book going back in time. And we use various scientific approaches to isolate things like pollen, obviously remains of plants, insects, we can even pull out DNA that's stored in the sediment. We can pull out charcoal which is produced by fire. We can use things like radiocarbon dating to work out exactly when in time our book is talking about.

[00:03:00]

By piecing and weaving all this information together, we can build if you like, a tapestry of change throughout time on this continent.

So, the Australian land mass if we go back far enough in time, the continents were differently configured: we're sitting at a particular latitude, what we call the mid-latitude, and along with that came a drier climate, and the gradual spread of plants that were tolerant of that dry climate. -And that's given us our very unique flora.

[00:03:30]

REBECCA MILLER: For me, the word “drylands” brings a lot of the Australian Continent to the fore.

My name's Dr. Rebecca Miller. I'm a research scientist working in seed science, and I'm one of the staff here who works with our Victorian Conservation Seedbank.

There are a lot of plants in Australia that grow in environments with very low rainfall, irregular rainfall, highly seasonal rainfall, so they might have extended periods of dryness.

MICHAEL-SHAWN FLETCHER: Climate change is gonna have really diverse impacts. In Southeast Australia, we're predicted to get hotter and drier in many parts, and that's going to require us really to think about the plants that we wanna live around.

[00:04:05]

CLARE HART: And that's what we're trying to do with the Drylands theme, to introduce a new palette of plants, that are gonna suit Melbourne's predicted warmer climate.

I'm Clare Hart. I am the Director of Horticulture here at the Royal Botanic Gardens Victoria, Melbourne Gardens.

A lot about gardening or horticulture, we are not doing it for today, it's often for tomorrow. It's the way that we are changing our planting palette to ensure that the trees, the plants, all the shrubs, are gonna be suited for a hotter, drier climate.

[00:04:34]

So, when we talk about predicted climates, we're looking at what the climate is for Melbourne in 2050, 2070 and 2090. We're transitioning the landscape today to be climate future-proof for those expected temperature rises. We want to make sure that this Garden is here for the future.

MICHAEL-SHAWN FLETCHER: I think we can draw a lot of inspiration, but also a lot of practical advice out of the plants that we have. It's a testament to the ability of plants to be responsive over long periods of time to environmental change, and we need to capitalize on that dynamism, if you like, as we move forward.

[00:05:07]

REBECCA MILLER: Trying to bring some of those plants that can exist in those low rainfall or periodically dry environments into a managed garden landscape is a really exciting prospect.

VP - JAKE S: *I sort of think of parts like Southern New South Wales, say when you pull off the side of the Hume Highway, there's a lot of dry sort of leaf litter around. Lots of crunching, bark.*

VP - LEE A: *I think of dry Eucalypt trees and small stunted shrubs, and branches that crunch under your feet, and everything being hot, but with a beautiful smell.*

[00:05:37]

VP - JAKE S: *There's a sensory aspect to it like the smell of the earth or the dust or the dryness about it. There's a tougher aspect to it.*

MICHAEL-SHAWN FLETCHER: The truth of Country in Australia is mainly dryland plants. So, for those to get a show, if you like, or an airing at a place like the Royal Botanical Gardens is really important.

JEANINE LEANE: "Seasons of despair, provide fertile ground to plant seeds of resilience and grow future solutions."

[00:06:08]

CLARE HART: Eucalypt Lawn has a really interesting history, it came about through the design of William Guilfoyle you know 1870s, 1880s. And it was about 1900 that this area was dedicated to Australian native plants.

We need to remember that it was always native plants. It held, indigenous species for millennia. Pre-Colonial, this was an area that existed with beautiful, significant vegetation, including some of the remnant species that are in that space now.

[00:06:37]

GEORGIE MOYES: So, this area was chosen to be the Australian Drylands because the lawn I think created a really good backdrop for it with only Eucalypts on it.

Hi, I am Georgie Moyes. I'm a Horticulturist at the Royal Botanic Gardens Melbourne and I'm curator of the Australian Drylands Collection.

A lot of the other collections at this end of the Gardens are representing arid or drier flora from other parts of the world: like the Volcano, the Arid Garden, the North American Drylands. So, this is forming an Arid Precinct.

[00:07:06]

CLARE HART: It's also a great way to connect our Australian Forest Walk, and that really does move from rainforest into what we call dry rainforest as well, so it was a natural succession to then create an Australian Drylands Garden.

MICHAEL-SHAWN FLETCHER: Australia's got a particular unique circumstance that we are sitting on incredibly infertile soils. Nutrient deficiency in Australia is almost unparalleled and the plants have had to adapt really incredibly tough plants have had to adapt with low nutrients and low moisture over long, long periods of time. And that's given us our very unique flora.

[00:07:38]

GEORGIE MOYES: There's plants in here that we've sourced from wild collected growers in Victoria, New South Wales, South Australia, Western Australia and the Centre.

REBECCA MILLER: What we're trying is a range of new approaches to establish different plants and different collections of plants in the landscape. And it's intended to be something from which we learn and which evolves over time.

GEORGIE MOYES: I'm a horticulturist so I try to let - natural systems inform the horticulture. Even though it's a garden, I ultimately want it to look as natural as possible. Where people can smell the smells and hear the sounds that they would in the bush.

[00:08:10]

CLARE HART: But it also allows us to do a whole lot of conservation work. And it assists our science team.

REBECCA MILLER: One specific example is the inclusion of some native meadow plantings. So instead of just having the lawn beneath the Eucalypt trees, there are several garden beds, direct sown with native flowers and native grasses. We've worked

really closely with Katherine Horsfall from the University of Melbourne who's done a lot of research on how to get native meadows established in urban landscapes.

[00:08:36]

VP - LEE S: I think the thing that caught my eye was the wildflowers that I could see when I came in that springtime and walked through that particular gate. That was the most striking thing about it for me, it like drew me in.

REBECCA MILLER: Working with the Seedbank, there's a real opportunity for us to incorporate some threatened species, and then to harvest seed and to have them there as a living collection.

CLARE HART: What we're trying to do with the Australian Drylands is to create a big experiment. We really don't know what's gonna happen in that space. There is going to be failure, and we expect that. Some of the plants that we've got, they hadn't been grown in Botanic Gardens before.

[00:09:08]

REBECCA MILLER: I think the Australian Drylands is a fantastic example of the many facets of botanic gardens. They're beautiful spaces for people to visit, they're places for scientists to learn and study, for horticulturalists to try new things, but they're also places of learning.

VP - JAKE S: *I remember coming here maybe 16 or 17 years ago as part of my environmental science degree, we would come to the Gardens and we would look at the different areas, and particularly the Australian bush areas around this corner of the Gardens.*

[00:09:37]

It was just sort of a, I guess, a grassland sort of area with some native trees. And now I've seen the change, it feels like a much more inviting, interesting area of the Gardens.

VP - LEE A: *It's incredible. I've been blown away really. The different areas, it doesn't look that dry. It actually looks quite lush, even though you've used, drought tolerant plants.*

VP - LEE S: *It just feels like a very, very different landscape to the rest of the Gardens.*

[00:10:03]

VP - LEE A: *It's a lovely progression as you walk through it from the sunny spots to the shady spots. Every turn of the path you see something new.*

VP - LEE S: *The design of it is that it kind of weaves you around and then you hit these paths. Which leads you through to the beautiful poetry sculptures.*

VP - LEE A: *Yeah, a total surprise.*

REBECCA MILLER: Plants have an extraordinary array of adaptations already to the environments in which they grow. They're rooted in the ground. they can't flee their predators. They can't seek shade; they can't move in the ways that animals can. So, they're forced to adapt, and they have all these tools at their disposal to do that.

[00:10:37]

CLARE HART: When we talk about adaptation in the Australian Drylands Garden, there's really two ways that we reference it. One is plant adaptation, so the way that plants have adapted to our low rainfall, low nutrient soils, fire et cetera. Preserving water is absolutely key. Eucalyptus leaves, for example, they hang in a very vertical fashion so that they're not exposing their whole leaf to the hot sun. You'll see that thinner side is what they're exposing to the sun.

[00:11:02]

VP - LEE A: *I always think of plants that have got a grey, silvery, sometimes almost a velvety feel to the leaf, and that usually got little tiny hairs on the leaves which keep the heat out, they act like a little bit of a protective blanket and they also reflect a lot of the heat away. Leaves like that are gorgeous to touch.*

MICHAEL-SHAWN FLETCHER: All of these sort of adaptations that plants have been forced to develop, mitigate water loss. And Australian plants are amazing like that. We have what some places would call deserts that are basically lush.

[00:11:37]

CLARE HART: The other way we talk about adaptation is the way that we're adapting our landscape, to suit a climate future Melbourne. In 2018, we decided to hold the first

inaugural Climate Change Summit. We invited people from across the globe. We had representatives from China, South Africa, from the UK, from America, Argentina, Spain.

[00:11:59]

We also invited people who were experiencing similar climates to us so that we knew that we were going to have a similar conversation and that we had similar issues. That summit really established what we call the Climate Change Alliance of Botanic Gardens. We have over 500 members. It's a global knowledge sharing platform for climate adaptation in Botanic Gardens.

JEANINE LEANE: “Nothing grows without a seed. Nothing changes without growth. Seeds are custodians of change.”

[00:12:32]

It was a really positive experience working with *Seeds of Hope* and being invited to work with the Australian Drylands. It gave me this real opportunity to ponder on the amazing capacity and resilience of seeds. The words are like seeds and as an allegory for First Nations People and people more broadly, seeds carry the future within them.

[00:12:57]

REBECCA MILLER: The Botanic Gardens houses the Victorian Conservation Seedbank, so in the basement of the Herbarium. Essentially, it's a couple of three door freezers! And our seedbank is collections of seed for conservation and research of primarily Victorian flora, focusing on rare and threatened taxa. So, making sure that we have good insurance collections if you like.

We have something over 1700 species represented in the Seedbank and a bit over two and a half thousand different seed collections, certainly over 10 billion seed. And it's about 50% of the State's flora that's captured in those seed collections that we hold.

[00:13:32]

But it's not a case of just collecting something and then just putting in the freezer and forgetting about it. Seeds are living things, many of them have very complicated dormancy where the seeds require particular triggers or cues to get them to germinate.

GEORGIE MOYES: When we started sourcing seed, a big part of that was troubleshooting how we germinate things. Some seeds need to weather in the environment. It's part of this process of like breaking down a protective seed coat. So, the seed coat might be there to stop ants eating it, for example, or to make sure it doesn't germinate too quickly when there's not enough water in the environment.

[00:14:08]

Our wonderful propagator at the time built a smoker and was smoking the seed to different temperatures as well as scarifying some of the seed coats, scratching them with razor blades. It was a wonderful time of experimentation to try to grow these new species and figure out how to do it.

REBECCA MILLER: We keep really detailed records about where plants have come from. And in the Drylands in particular, there's been a real focus on cuttings, taken from diverse plants in their natural habitat or from seed collections, either held with the Victorian Conservation Seedbank or specifically collected for that.

[00:14:40]

GEORGIE MOYES: We use a system called the Living Collections Database, which is a way for us to allocate a specific number to an individual plant. We map it, based on grid reference, the whole Gardens is gridded. So, you write notes of where things come from, the habitat they're found in, the date that they were collected, was it seed, was it cuttings, and then where it's planted in the Gardens.

[00:15:03]

REBECCA MILLER: Known provenance is a really important part of what makes a scientifically, relevant, plant collection. Particularly as we go forward and aspire to assist with conservation of threatened plant species.

JEANINE LEANE: "Trees are old stories. Pods and seeds are words that grow. Bark chapters fall to earth, turn to dust, scatter and renew. Wood is a deep archive, an ancient custodian of memories."

[00:15:40]

REBECCA MILLER: So, the concept of succession describes changes, sequential changes, if you like, in plant communities over time. There might be a cyclone up in the

tropical rainforest where trees come down and suddenly there's an influx of sunlight to the ground. These pioneer species, as they're termed, rapidly grow to fill that space, and then over time, they'll die back, and some slower growing species will establish. So, there's this real succession of things in the landscape over a period of time.

[00:16:06]

The other landscape where it's really, clear to talk about succession is the post-fire landscape.

GEORGIE MOYES: Some plants in the Australian landscape need fire to prompt germination to release seeds held within cones, which is also just another protective mechanism. There's a whole suite of species like grasses and peas, a lot of acacias that will be the first things to germinate after fire and just really, take a hold of that landscape.

[00:16:30]

MICHAEL-SHAWN FLETCHER: Eucalypts are a fascinating organism. They produce conditions in which they will burn, and they rely on that burning. There's a wonderful hypothesis by a very renowned fire ecologist, William Bond. And the title of his hypothesis is “Kill Thy Neighbour” - where Eucalypts essentially destroy themselves and the plants around them to clear a space for their seeds to recruit underneath them.

By and large, the vast majority of Eucalypts are favoured reproductively by fire. And some of them, for example, the very famous Mountain Ash do this by complete self-immolation. They destroy themselves and their entire community.

[00:17:08]

The big seed release following that fire results in a massive recruitment event after that and that's their biology. Eucalypts have exploited the relationship with fire to the degree where they're ecological engineers, they change a landscape. And what we see with the removal of, Aboriginal cultural burning, particularly say for example, in the Croajingolong National Park, which is Gunaikurnai country in Gippsland, one of the areas that burnt in the catastrophic Black Summer Fires of 2019, 2020.

[00:17:34]

In our data, following the removal of Gunaikurnai, the Eucalypt cover more than doubled, and you started to see the first evidence of big hot fires. Lots of charcoal coming in, lots of evidence of soil erosion after fire. Within a couple of decades, the whole fire regime had changed, and the fires were burning so hot that they burnt the soil.

REBECCA MILLER: One of the things when we think about what climate change means for species is it's really important to recognize that First Nations Australians have seen massive landscape change and have been custodians and managers of that landscape change.

[00:18:10]

MICHAEL-SHAWN FLETCHER: Aboriginal people just didn't create monocultures. We see in the Western deserts that when Martu were able to return their care and management back to their lands, they started burning so that there were multiple areas at different stages of recovery from fire. They have this kind of seven-year cycle of burning and almost immediately the biodiversity more than doubled in this landscape because people were burning in small patches, they were burning on average more than seven times a year on their Country.

[00:18:40]

But they weren't just single fires burning the whole lot they were tiny fires creating a diversity. And they interrupt the fuel loads so that big hot fires don't roll through.

REBECCA MILLER: There's much to learn there. There is a body of knowledge in Australia and increasingly I think there's recognition of the importance of these different knowledge systems and two-way learning.

[00:19:00]

MICHAEL-SHAWN FLETCHER: For Aboriginal people there's no Cartesian split between humans and nature. We're part of the same system and we depend on each other. We have obligations to do the right thing for Country and Country then looks after us.

In the Australian context, there is no such thing as wild country. You know, there's no such thing as wilderness, you know? And we see this spate of efforts to, to rewild the Australian landscape, and names mean a lot, the way that we frame things through

their name means a lot. If you call something “wild”, wild has a discreet meaning of something in a state of nature that is, in the Oxford English dictionary, it is uninfluenced by people. It is the anti- statement to caring for Country or cultural care and management of Country.

[00:19:42]

To frame returning an area to be an Aboriginal landscape or a cultural landscape as rewilding, it's not only insulting, it's just unhelpful. And creates mental barriers as to what we're actually doing.

There's this very European idea of what cultured landscapes look like: farms, fences, there are all these sorts of things, and there's a failure to recognize that the landscapes that the British arrived into and invaded were equally humanized landscapes, even though there were no fences and farms and machinery and all this kind of stuff.

[00:20:12]

The failure to kind of recognize that has paved the way for the theft of the Country from Aboriginal people, basically calling it a wilderness is tantamount to calling it Terra Nullius, and under international law at the time, if an area was a Terra Nullius or a wilderness, it was free to be taken.

The benchmarks that we're measuring our biodiversity loss from on this continent are humanized benchmarks. They're benchmarks of biodiversity that were in many cases the result of Aboriginal care and management. And that's what we're trying to return to.

[00:20:42]

CLARE HART: How a Botanic Garden, a very highly curated space sits within Country, I would just take the word Botanic out of it and just call it a Garden. And then we can reduce that even further, just take garden away. This is Country. -There' s some very significant trees, so we have the Cockatoo Tree, the Lion's Head Tree, Separation Tree, they're all sentinels across this site and they've been watching this landscape long before it became a botanic garden, and they'll be here potentially long after.

[00:21:12]

MICHAEL-SHAWN FLETCHER: Whilst the origin of places like the Royal Botanical Gardens was to reimagine a familiar environment for the invaders and colonisers,

they're much more than that today. I think in a very urbanized world, they're a connection to Country and I think whilst they're not a connection directly to the kind of Country that was here, there a connection to the fact that we live in something that is vastly different to the world that we've created around us.

[00:21:42]

JEANINE LEANE: It is also an important part of the changing times of Country, you know, and, and some of that wasn't always to our own liking. But I see gardens as an attempt to have a very productive and shared discussion with Country. The reality of it is, that we are all here!

[00:22:04]

MICHAEL-SHAWN FLETCHER: That portal, if you like, can then be used like the Dryland exhibit, to then bring people further in on the connection.

JEANINE LEANE: I think Country has been exceedingly generous and accommodating in hosting all these stories now. A lot of these introduced plants, introduced species, it's true they weren't here a few centuries ago. But they are part of the story of here now.

MICHAEL-SHAWN FLETCHER: Any way that people can connect to place and get an experience of the different facets of Country, I think is incredibly powerful.

[00:22:35]

JEANINE LEANE: Whether it's a really large kind of capital city Royal Botanic Garden, or whether it is a local park. Nurture this conversation!

GEORGIE MOYES: If I think back to what really got me into nature and like, inquiring about nature and natural systems, it was probably gardens. You know, seeing species diversity and being curious about like, wow, what the hell is that? Like, what am I looking at here? Where does that come from? And tracing back, you know, fascinating plants, where they've evolved to and learning about their ecology and where they fit into the natural world.

[00:23:11]

VP - JAKE S: *I enjoy being here because I get to see stuff from all around the world, but also, I like seeing stuff that's from here and that's one of the draw cards about it as well.*

If there's opportunities to sort of do that and restore some of those areas as close to as possible is what it was, I think that's really valuable.

VP - LEE A: *I really like the fact that all through its history, even though it's a wonderful recreation space. It's had this scientific purpose to it all the way through. And you are doing it here again.*

[00:23:40]

JEANINE LEANE: “Inside each seed grows a future. Seeds are the custodians that hold the future. Seeds are containers of possibility and hope.”

[00:24:00]

CLARE HART: When people are experiencing the Australian Drylands Garden, I would really like them to have an understanding of our past, our present and our future. And to take home a message that there is positivity around climate change. That they are also the agents of change, and that any tiny task can contribute to a climate positive future.

[00:24:26]

REBECCA MILLER: There's lots of things at an individual level, if people have garden space that they can do. So, shade trees, or thinking about the orientation of your house and the garden and the microclimates and how you could combine plants to maximize cooling benefit. What might be suited to their soil type and to the rainfall and the climate that they locally experience. Thinking about species selection just as we have with the Dryland is something everyone can do.

VP - LEE A: *I think the big change happened back in the late nineties, we had that very long drought and people really had to start thinking, this might be going to be forever. So, I was thinking, well, I normally would've planted this, but it's gonna need too much water, so I think it'll just continue to happen.*

[00:25:09]

VP - JAKE S: *So, our garden is in its infancy, I would say. It's a very hot, west facing balcony with blazing sun almost every day and a lot of wind.*

VP - LEE S: *We've only been in this place for, what, six months? So, we're still trying to figure out what won't die, basically.*

[00:25:29]

JEANINE LEANE: You can make a green space in the smallest of spaces. You can do it on balconies and even window boxes. We can all be a bit more proactive than we thought we could previously be. And particularly with public spaces, and I do notice a lot more people are doing street gardens or they're just turning their nature strip into something where they're growing native plants.

MICHAEL-SHAWN FLETCHER: We are living now in a very different world, and I think one way we can sort of achieve the long-term sustainability is being careful with the world that we craft around us.

[00:26:05]

GEORGIE MOYES: In terms of home gardeners, it just makes sense to me to be planting things that are already adapted to our climate. I currently live in a rental and, like I'm a very, I would say a harsh gardener at home, like I've got a veggie patch, but apart from that, I'm growing things that are like super robust, I don't wanna be watering every night so I grow really, really tough things, like I grow a lot of grasses at home, native grasses.

[00:26:30]

VP - JAKE S: *And maybe that's the key too, looking at those things that have a bit of a symbiosis between them that exist because the other one's there or that help the other one in terms of the designs of their gardens as well. Like creating environments where there can be water reused, the way that plants are fertilized, and compost is used. Those kinds of things can be a bit more of a closed loop kind of system rather than having to rely on additional resources all the time.*

[00:26:54]

MICHAEL-SHAWN FLETCHER: I've got two thoughts about a garden. A garden's either got to be a native garden, or it's got to have uses. So, I've gone the use side of things, so pretty much every plant in my garden, from grapes through to veggies through to herbs through to fruit trees, have a use. Which I think is exactly what you would need to do if you're living on Country every day of your life, every minute of your life. No supermarket down the road, no shop to go and pop in, you would have to have a use for every plant that you encounter. There'd have to be a reason to expend energy to make sure that that plant survives and prospers.

[00:27:33]

JEANINE LEANE: Initially I think I was resistant to introducing different things to different areas, but I have come to think now that the way Country is changing, Country responds and is resilient in that way and I think the landscape needs to dialogue as well. And we need to bring things into different places that weren't necessarily there before because the nature of those places have changed.

[00:28:03]

CLARE HART: Climate adaptation in home gardens does need to be considered and, and it should just be considered as what we do now, uh, in home gardens, in balconies. And it's not a difficult thing, you can still grow your usual vegetables and other plants. It's really just factoring that climate approach in so that it helps your future decision making. What I will say as well that it allows you to step into that climate space with some energy and some, some power to take it back from feeling useless or feeling like there's nothing that you can do.

[00:28:34]

JEANINE LEANE: "It is in the nature of seeds to know when to be still and when to break open and rise into action."

Mandaang guwu. Thank you.

[00:28:57]

SALLY MCPHEE: You've been listening to Sonica Botanica, created by Patrick Cronin and Royal Botanic Gardens Victoria. Thank you to all the guests on this episode, Dr. Jeanine Leane, Professor Michael-Shawn Fletcher, Clare Hart, Dr. Rebecca Miller, Georgie Moyse, and a very special thanks to Lee Serle, Jake Shackleton and Lee Andrews, who shared their thoughts and impressions whilst visiting the Australian Drylands.

This episode was recorded in February and March 2025, on location at Royal Botanic Gardens. Melbourne. Music, audio editing and sound design by Patrick Cronin.

Thanks for listening!