Underground animation transcripts

The following transcripts are spoken text that overlays various animations of rocks and sand, artworks created by Agnieszka Woznicka as she experimented in Tom Raimondo's lab here at UniSA.

Ali Gumillya Baker

Introduction

My name is Ali Gumillya Baker, and I'm an artist and an academic. I was born and raised on Kaurna Yarta. My family are from the west coast of South Australia, from the Nullarbor. We're Mirning people. My Nanna was born in a place called Fowlers Bay, which is east of Yalata. She used to tell us stories about the Country over there. It's very big sky country. And I think about the kind of the land and the vastness of the desert. It's a beautiful place on the planet.

Deep Time

Even the most modest kind of archaeological estimates of the occupation of this country, we're talking about thousands of generations of people. I talk about this often with students, we might remember a few generations, but to have stories that are continuous for thousands of generations is be almost beyond comprehension, in the same way that it's almost beyond comprehension to imagine that the Nullarbor and Antarctica were once connected.

On Connection

Thinking about the Earth, and loving the Earth is a really important. I love the Nullarbor, and I think about it a lot, all the time. And maybe, you know, and it's obviously because of my matriarchal connection to that Country. But it's also because the Earth is a living body. Even though we might not understand stones to have sentient qualities, every aspect, every kind is part of the earth. And every part of our bodies is part of that matter.

Tom Raimondo

Deep Time

Deep time is our understanding of the entirety of Earth's history. So, as a geologist, you have to put processes and interactions that occur within the Earth's system into a timeframe of some kind. Now, that's really hard. Take time is our understanding of the entirety of Earth's history. So, as a geologist, you have to put processes and interactions that occur within your system into a timeframe of some kind. Now, that's really hard when we try and compare it to our own human existence, because each of us only lives over say decades, if we talk about the differences between generations, you might be talking about hundreds of years. If you talk about the entirety of human history, we're talking about 10s of thousands of years, or hundreds of thousands of years at most, it's so infinitesimally small in the context of the entirety of Earth's history, that we need a different concept to explain it. And that's where deep time comes in. Because we're talking about four and a half billion years, when we talk about the Earth from its inception up until the present day. Deep time allows us to place the key events in Earth's history in some kind of sequence, and try and get our head around exactly how much time elapsed between each of those key events because they are such long periods of time. There are so many changes that occur within that window that we just have no record of. And so deep time is able to help place all of that in order, and come to some kind of understanding of what the evolution of the Earth is over that time.

Ediacaran Fossils

The Ediacaran fossils represent the birth of life on Earth. They are the earliest life forms that we have. They are unique, some of them to South Australia. They were the first fossils of that period discovered. Studying them gives us an insight into where we came from. They give us an insight into how life on Earth evolved.

Antarctica and the Nullarbor are twin landscapes

Southern Australia and Eastern Antarctica are twin landscapes. They are geological cousins. They were once conjoined. And have since separated over millions of years to be in the positions they are today. That means they share geology. And the rocks that sit on the southern margin of Australia on the Nullarbor are the direct equivalents of those that lie beneath the ice sheets in eastern Antarctica. Just by complete fortune, it so happened that there was a drilling program a few years ago, in the place called the Coompana Province, which is on the Nullarbor Plain. It's the first time drilling was ever done in that region. And it was the first time that we were accessing rocks that were the direct equivalents of the Totten Glacier and Eastern Antarctica. Now the Totten glacier itself has the potential for about three and a half meters of sea level rise. So it's an extremely important part of the Antarctic ice sheet.

Identifying Rocks

Identifying rocks comes down to minerals. Minerals are the building blocks of rocks So if we can understand what minerals make up a rock, we can identify it. So the microscope is often the starting point for doing that once you've done your observation usually it's with your own naked eyes or maybe with a hand lens. Usually what you would switch to then is a microscope to better understand the range of minerals and more completely identify what makes them up.

Hot rocks

So the Earth actually has two main different sources of heat that come from internally. It has primordial heat, which is basically the heat that's left over from when the earth initially formed and coalesced into the ball that it is now, that's about half. It also has about half of it’s heat generated from radioactivity. There are naturally radioactive elements that exist within the earth that are decaying over time and releasing heat, as part of that process. Australia in general is abnormally hot. Yes. It has heat production values which give us some indication of the heat sources that exist within in the earth. Australia's heat production values are about twice what the global continental average is, so we're really quite hot.

Drill cores

We have very few ways to directly access the deep earth. Mostly the way that geologists learn about the deep earth is by remotely sensing information. So geophysical techniques are our standard mechanism for doing that. You apply some sort of energy, whether that's an artificial energy source or a natural energy source, whether it's lightning strikes or earthquakes or whatever. And we have very sensitive instruments that measure how those sound waves or energy waves of some kind, interact with the subsurface. And we detect them and we use that to build a picture of what's going on deep within the earth. The only direct way that we can do it, though, to verify those models we've generated and to actually get a physical specimen derived from those depths is by drilling holes. That's actually the only way that we can do it. And of course, that is a very expensive technique. It's a very technically challenging technique in order to derive those samples, and that means those samples are so precious when you do get them because of where they come from. They come from a portion of the earth that no one's ever seen before.

Microscopy

Microscopes are our window into the universe of rocks. Basically, they allow us to see very small scale features that you can't see with the naked eye but are just these really beautiful and intricate records of rock processes. And the way we do that is by shining light through the minerals. We polish them down until they're incredibly thin, so about 30 microns thick, which is thinner than a human hair, and that allows them to be transparent and because of that, if you shine light through the light interacts with different minerals in different ways. So all of the physical properties of that mineral, allow the light to be refracted for example, or to be broken up and displayed in different colours. All of these things have significance in terms of identifying the mineral, looking at its zoning features, for example, and being able to distinguish one mineral from the other.

Being a geologist

When you're a geologist, you've got to be a bit of a mix of everything. You’ve got to be a bit of a mineralogist, you've got to be a bit of a geochemist. And you've got to be a bit of a big picture geologist, tectonics sort of person that can kind of bridge all of those different elements to tell a story of a rock. So fundamentally, it comes down to what are the elements that record different geochemical processes that may have dictated the life of that rock? What are the minerals that fundamentally record those interactions? And the minerals may do that via something that's akin to tree rings, when you when you slice through a tree and you see the different growth rings that represent all of its evolution, you know, he might have rings that are a little thicker or a little bit thinner, and that represent different periods of that trees history. Minerals are no different. They have zoning, they have all sorts of ways that they're arranged that tell us a story about you know, the daily or the yearly or the decade long processes that dictated the growth of the minerals. Geologists are picking up all of those different clues, whether it's in the chemistry, whether it's in the microstructure, whether it's in the rate the arrangements of minerals in order to build a bit of a story.

Agnieszka Woznicka

On animation as a process

I felt like animation was the right process to explore these slices. Because animation has this unique ability to compress time, when certain processes like the processes that take millions of years can be represented in a fraction of time. And also, animation has this ability to imbue with life and life force to an inanimate object. So that was why I was thinking about animation. I thought it was perfect for video for to show these hidden universes.

On exploring minerals in Tom’s lab

Microworlds that had so many different colours, patterns, different shapes, this intricate networks and so you cannot see this with the naked eye. You can only see it with a very high magnification polarizing light. so we use polarized filters and unpolarized and depending on the on the light and filters and magnification, there's just incredible [detail], you know, like in a universe, and it's it was really fascinating to see that.