4.3
INTRODUCTION TO GEOLOGY

0:11–1:21

UNDERSTANDING EARTH

I'm a geologist. That means I spend my time trying to understand the Earth. I want to tell you very briefly about how I came to be interested in geology, what kinds of geologists there are, what tools we use, and then what are the big questions that you might get interested in if you decided to become a geologist.

Well, I think I always knew I wanted to be a scientist of some kind, but the idea of spending every day inside a laboratory didn't appeal to me very much. And then sometime in high school, I learned about geologists. I learned that these are scientists who go out and work outdoors and live all over the world, so that's what I became. And it's been great.

I've had the opportunity to work all over this country and in Mexico and South America and in Africa and in Europe and in Asia. And this has led to a deep understanding of the history of the Earth. And now I've come to realize that that's just part of the much bigger story of everything that's happened in the past. It's one part of Big History.

1:21–2:20

ROCKS HAVE MEMORY

So Earth is just fascinating, and geologists study all different aspects of the Earth. Some geologists are really interested in processes, like, how do volcanoes erupt and what happens when a glacier flows down out of the mountains.

Other geologists, and I'm one of them, are really interested in Earth history. So how do you find out about Earth history, things that happened millions of years ago when there were no people around to write them down? Well, we look at rocks. And here's a very good piece of understanding. Liquids and gasses are always changing, moving around, but solids stay the same for long times. So thinking about the natural case, in geology we say that atmospheres and oceans forget, but that rocks remember.

2:20–3:14

TOOLS OF THE TRADE

So here's a rock, for example, that remembers the great impact 65 million years ago that caused the extinction of the dinosaurs, or here's another rock, all twisted and folded and cooked up and changed, and this rock remembers the collision between Italy and Europe that caused the formation of the mountain range of the Alps.

So how do we learn about this history? What tools do we use? Well, in the field, the tools are fairly simple,

and it almost seems like a joke, but the hammer is very important. If you're going to break off a piece of a rock and bring it home to study, you need a hammer. And maybe you need a compass to find out what the orientations of the structures in the rocks are.

3:14–4:02

LOOKING DEEPER

So then you bring the rocks back from the field to the lab, and we have wonderful new instruments that we use for finding out about rocks in details. For example, there's the electron microprobe. And get this, it will let you make a whole series of chemical analyses across a single grain of a mineral. And there are electron microscopes that let you see things that are far too small to be seen just by looking down an optical microscope. And there are wonderful tools, like mass spectrometers that let geologists determine the ages of ancient rocks in millions of years. So those are the tools that we use.

4:02–4:25

RECORDS OF LIFE

So, using these tools, what kinds of questions are there that you might get interested in, in trying to help answer? Well, some of the questions that interest me have to do with plate tectonics. Why is it that our planet has plate tectonics and continental drift and, as far as we know, none of the other planets do? And what drives the plates? What actually makes those continents move around? And what happens when two continents collide and push up a mountain range? What happens when that mountain range gets eroded? So those are all questions that one can answer by looking at the rock record.

And then there are questions also that deal with the history of life. Why did life get started on Earth and when? And why has it been possible for Earth to have life and again, as far as we know, none of the other planets do?

4:25–5:43

MANY QUESTIONS

Well, we answer those questions by looking at the fossils that we find in the rocks. And then there are other questions that have to do with climate. When in the past was it hot and dry? When was it hot, wet? When was it cold? For example, did you know that there were several times, three times rather, in the Earth's past when our planet was completely covered with ice and snow and glaciers from the north pole to the equator and on to the south pole? So questions: Why did that happen, and how was it ever possible for the Earth to get out of being completely covered with ice and snow?

5:43–6:33

YOUR FUTURE

So climate questions like that make you think about the future of climate, and what will it be like on Earth later in our lifetimes or in the lifetimes of generations to come?

And maybe that leads to the most important of all of the geological questions, which is: How do we protect our Earth? How do we keep it flourishing so that it's a place where people can continue to live? So that's just a small sample of some of the big questions that geologists are interested in and that we try to solve by looking at the rock record.

So maybe those would interest you. Maybe it's time to start thinking about becoming a geologist.