



Animated Life: Pangea

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MOTT GREENE: Hardly anyone in the early 20th century said, why are there oceans, and why are there continents? Wegener is a wonderful example of how science benefits from people coming from outside the scientific field and saying, well, why don't you look at it this way?

[1905: Alfred Wegener, meteorologist]

[Voice of Mott Greene, author, "Alfred Wegener: Science, Exploration, and the Theory of Continental Drift"]

MOTT GREENE: Getting into a balloon and going up into the air for a meteorologist is like getting into a boat and going out on the ocean for an oceanographer.

[floating above Beeskow, Germany]

[Voice of Naomi Oreskes, Harvard University]

NAOMI ORESKES: He goes up in a balloon because he wants to take measurements of the atmosphere. He's not the Wizard of Oz. He's a scientist doing science.

MOTT GREENE: Wegener flew as much and as often as he could. He wants to write the best book on the physics of the atmosphere, and no one had ever studied the atmosphere in the high Arctic before.

[1906-1908: Greenland Expedition I]

NAOMI ORESKES: This is a time in history when one of the most exciting things you can do as a scientist is to go on an Arctic expedition.

MOTT GREENE: It was adventure travel of a North Pole, South Pole kind. Wegener is out there in the winter night taking these huge box kites and attaching recording instruments to them and then winching them back down to get his instruments back.

NAOMI ORESKES: Nobody ever said that Arctic exploration was a picnic.

MOTT GREENE: Wegener had to learn how to hunt seals, how to drive a dog sled, how to travel on ice without being swept into open water, how to protect your dogs from polar bears. The travel in Greenland, his time with icebergs—

NAOMI ORESKES: The way in which the ice floes formed jigsaw puzzle pieces.

MOTT GREENE: The way the ice cap splits apart and fissures. All of this was part of his imagination when he made his discovery of continental drift.

[1910: The discovery]

NAOMI ORESKES: I wouldn't really call it a discovery. What he really had was an idea.

[The University of Marburg, Germany]

MOTT GREENE: He went to his office, and his office mate said, look at this beautiful atlas my parents gave me for Christmas. And he wrote to his fiancée, did you ever notice how South America fits into Africa? Let me pause and say, there isn't a child on earth over the age of 12 who hasn't had the same thought, right? You can see it. What was different about what Wegener saw—there were lines on the map that represented depths under the water, and they're exactly the same shape. That means that this is part of the structure of the Earth. How did that come about? Maybe the continents drifted apart.

NAOMI ORESKES: It was radical because it was new. The Americans say the continents are fixed. Europeans think they move, but they think they move up and down. And Wegener says, you're all wrong. Yes, they move, but they move horizontally, not vertically.

MOTT GREENE: He would write a paper in 1912, and he said, I think everybody will really be happy. And, of course, everyone wasn't really happy. Everyone became very unhappy.

[Voice of Roger McCoy, professor emeritus, University of Utah]

ROGER MCCOY: There was an almost universal rejection of his theories to begin with.

[1915 onward: backlash]

MOTT GREENE: Here's the problem—scientists are very suspicious of fundamental novelty.

ROGER MCCOY: He was regarded as an outsider by the geoscience community because he had no academic credentials in that field, and so he was not considered qualified to make any statements in that field. What he was doing that was so different, though, was drawing together multiple lines of evidence—not just geology, but vegetation and paleontology. The botanical people responded very positively because it explained the distribution of plants and animals over the world.

[Worldwide fossil distribution]

NAOMI ORESKES: In different places on Earth, you saw virtually the same fossil records. The stratigraphic columns were extremely similar as well, and Wegener's idea, his big idea, was you could explain all of those things if the continents had moved.

MOTT GREENE: So he would write a book in 1915. People said, well, this is wrong, and that's wrong. And then he wrote another book in 1920. He comes up with the name Pangaea, and then he wrote another one in 1922, and he kept fixing it and fixing it and fixing it. It's one thing to think of an idea, and it's another thing to work it out for 20 or 30 years.

ROGER MCCOY: That book is still available on Amazon.

NAOMI ORESKES: Continental drift was something he was interested in, but it was never the focus of his scientific life.

[1928-1930: Final Greenland expeditions]

MOTT GREENE: The Arctic pulled him back in. He was really too old—almost 50 years old.

ROGER MCCOY: He landed there with 98 tons of equipment.

MOTT GREENE: And from the beginning, things didn't go well.

ROGER MCCOY: They had many things go wrong.

MOTT GREENE: The base in the middle of the ice cap did not have enough food, and he said, this is my responsibility to resupply.

ROGER MCCOY: And he got several sleds together.

MOTT GREENE: It's the worst conditions you can possibly imagine. His companions wanted to give up. And at twilight, Wegener said, let's go for a walk. And he took them out and pointed to the ice and pointed to the sky and said, we're trying to find out how all this works. It doesn't matter whether we live or die. The important thing is that the work go on.

NAOMI ORESKES: And I guess that's why I love Alfred Wegener because it's not really about himself. It's that he believes in science, a kind of great, metaphorical expedition.

MOTT GREENE: At the end of all this, they were able to supply the station at the middle of the ice, and then they got there, and there wasn't enough food to last the winter for all of them. Wegener said, I'm going to go back to the coast. He didn't like to ride on the dog sled. He liked to ski next to the dogs. He had a heart attack and died.

He's still there. The German government wanted to bring him back for a big funeral, and his wife said, no, leave him there. He is where he wants to be.

[WHIMSICAL MUSIC]

[By the 1970s, mounting evidence convinced scientists that Wegener was right: The continents do move.]

[But continents don't "drift" along the ocean floor, as Wegener suggested. Instead, plates of the Earth's crust float on the mantle.]

[The theory of "plate tectonics" is now considered a fundamental principle of Earth science.]

MOTT GREENE: What he was wrong about was the physics of it, and he thought it happened way too fast. Here's what he got right—the continents move. They really do.

ROGER MCCOY: And, in fact, are still moving today.