Making North America: Origins (NOVA)

http://www.pbs.org/video/2365598165/

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Every good scientist is good at one thing: asking questions. Throughout the video, Kirk Johnson asks different questions, which he provides answers/evidence for so that we can explain how our continent was made. This worksheet will focus on questions (Back Side) from the video and the evidence provided to create an explanation. There are also four important quotes from the video that we’ll discuss later.*

Fill in the following quotes from the video

1. Grand Canyon Quote:

“Each layer is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, with a slice of our continent’s epic history locked inside, stretching millions of years into the past. Every single one of these layers tells its own \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of what North America was like when that layer was \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.”

2. Lake Superior Quote:

“One thing as a geologist you learn pretty quickly is that every \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.”

3. Taconic Mountains/New York Quote:

“The ancient Taconic mountains were really big, they were the size of the Alps, maybe 13,000 feet tall. Today very little remains. So where did they go? In Manhattan they \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ away leaving only bedrock. This reveals one of the great geological truths: \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.”

4. End of video Quote:

“We know one thing for sure in geology: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ever stays the \_\_\_\_\_\_\_\_\_\_\_\_\_ for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.”

Choose three questions that Kirk Johnson asks in the program. Write down the question he asks, and then the answer/evidence that’s provided.

Question 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Evidence/answer for Question 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Question 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Evidence/answer for Question 2:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Question 3: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Evidence/answer for Question 3:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Video notes (typed in stream of consciousness)

“Each layer is a time capsule, with a slice of our continent’s epic history locked inside, stretching millions of years into the past. Every single one of these layers tells its own story of what North America was like when that layer was deposited.”

“One thing as a geologist you learn pretty quickly is that every pebble tells a story.”

Today very little remains. So where did they go? In Manhattan they eroded away leaving only bedrock. This reveals one of the great geological truths: no landscape is permanent

Each layer is a time capsule. Every single layer tells what North America was like.

Pinkish Rock Sandstone. Esplanade Layer shows 300 mya. Vast sea of sand. (Desert of endless dunes. Sand compressed and formed sandstone.

Further down, limestone loaded with fossils. Landscape was once under water, 340 mya. Shallow sea (explains how limestone was formed).

Granodioirite. By measuring radioactive elements, know that it formed 1.7 bya.

First rocks of the planet formed 4 bya. Was a molten rock, under fire from asteroids. Eventually bombardment slowed, earth cooled, and formed crust. Water seeped from rocks, oceans covered planet. Hardly any land.

Continents got started?

Hawaii. Kilauea. Has spewed out 10 b tons of lava. All land started out as lava cooling into dark volcanic rock. Basalt (ocean floor, ocean crust, volcanic islands)

Granite forms continents. How do you get granite from only basalt.

Planet is broken into plates. Heat beneath them softens them, moves them like a conveyor belt.

One of the oldest blocks of NA merged with other chunks 1.7 bya for forma Laurentia. Form a solid foundation that reaches 100 miles deeper into the earth than the rest of NA.

Lake Superior shores. Evidence of event that almost ripped Laurentia apart.
Every Single pebble tells a story!

Agates form in cavities of rocks formed by gas bubbles. They show that volcanoes are not far away

Gooseberryfalls, made almost completely of volcanic rocks. These falls have 5 steps, each one is a different volcanic eruptions. Goes deeper into the ground. How deep? Array of seismic sensors pinned into ground. Seismic waves travel at different speeds through differenet rocks. Baslast below superior reachs 55 km (30 mi) below the surface. Almost 1bya, huge torrents of lava poured from earth for about 20 my. Burned up large area.

US Array deployed. Have revelead an ancient geological wound. Iowa, Minn, michicgan, 2000 miles long, threatened to split continent apart. But it stopped, mysteriously.

What happened to keep the continent whole? What stopped it? May have been different continents converging to create Rodinia. When it broke up, the rift had healed.

Continent has a stable core, but to build coastlines, it would take a beating.

Making the East coast we know today is an epic story of heat and collisions.
Manhattan: Big Rock, bedrock outcrops. Manhattan Schist. Extremely hard. Allows foundation for the new buildings. Started its life as mud. Has a shine to it. Mineral muscovite, forms platy crystals. Forms at over 500 degrees.

Half a biollion years ago, chain of volcanic islands headed towards NW, bulldozed mud and dumbed on east coats and buried it.

In areas with tall skyscrapers, there is outcrops that allows the buildings to be built.

Flat coastal plain was turned into mountain range. Taconic Mountains. Were caused by convergence. But where did they go? In Manhattan they eroded away. **No landscape is permanent**

Utah. Zion canyon. Sandstone cliffs. 200mya, were endless dunes in a vast desert covering west. Stcked dunes over time. Bear witness to dramatic phase in continents history. 300 mya, pangea was created. Towering mountain range rose in middle, disrupted climate, and made a large desert. Everything was so far from water there was no moisture to create rainfall.

Strangley regular circles in sandstone. What made them? Earthquakes? Pangea was too big. Trapped heat caused stress, creating earthquakes. Streams of groundwater shot through the dunes and created quicksand.

Pangea cracked apart, sea filled in the rift. NA difted northward and became green again.

But no Rockies were present. Miles high. Have come and gone several times. Outsude of Denver. Uplift of Rockies. Bizarre landscape. Jagged slabs of sandstone jutting out of ground. Tilted. What happened here? The slabs (cloer look) have big pebbles with sharp edges. River. Begins in mountains. Can’t be the rockies, because the sandstone formed before the rockies existed. 300mya, there was a new mtn range (ancestral rockies). Almost as high as rockies of today. Millions of years ground down to sand and gravle, compressed. Why are they tilted?

70mya,, the rockies rock was underground and coverd. Western edge of NA dov beneath earth, then bulldozed farther inland. Made Rockies 2.0. lifted up 10000feet of rock above them. Colossal mountain eroded down, then 10mya the area was uplifted. Still being uplifted.

West coast (big sur, pacific NW volcanoes, fjords of BC and Alaska). Looking for fossils. Fossilized Palm Frond. But we’re on the shores of Alaska. Grew when climate was warmer. Also have fossilized coral. Much older. Lived near equator. How did they get there?corals hitched a ride on islands smacking into America. Radically reshaped coastline.

West coast is most recent addition to NA.

Coast of CA, Tomales Bay. Rocks on opposite side of bay have been moving from South. Standing on San Andreas Fault. Separates Pacific and NA plates, sliding in opposite directions. Moving at a few inches each year. Tension can trigger violent EQs, like 1906 San Fran quake. 1989, 1993. LA will be next to San Fran.

Nothing Ever stays the same for very long.

We know one thing for sure in geology: nothing Ever stays the same for very long.