Geomagnetic Polarity Timescale (GPTS) Activity

Materials:

Rocks (1 per student)
Labels (1 per Rock)
GPTS activity data sheet
Black Construction paper (1 per student)
White Construction paper (1 per student)
Heavy duty tape (or Camara)

Prep:

Print out label templates, and write in ages and VGPs from the GPTS activity data sheet (which lists authentic scientific data). Attach one label to each rock.

Context: This activity is meant to help students grasp the meaning of the 'magnetic stripes on the seafloor' which were a crucial piece of evidence for plate tectonics. Before doing this activity, students should hear a lecture on background information about the Earth's magnetic field, including that it reverses, and that rocks become magnetized by the field and record it.

Instructions to give (verbally) to students:

1. You will each get a rock which is labeled with a Virtual Geomagnetic Pole (VGP) location (in latitude and longitude) and an age of the rock. You must decide if your rock recorded a Normal or Reverse Polarity magnetic field. Positive latitude for VGP means the pole is in the northern hemisphere, and so the rock recorded a Normal polarity. Negative latitude for a VGP means the pole is in the southern hemisphere, and so the rock recorded a Reverse polarity.

2. Each student get a labeled rock from the pile.

3. Now, all students line up against a wall by age of their rocks - make sure to form a single file line, standing shoulder to shoulder. *NOTE: depending on time constrains, teacher may have students go down the line and say their rock age, to be sure they are in the correct order - the ages have decimals and some students get confused there.*

4. All students who are normal polarity (positive latitude VGP), raise hands. *The teacher walks down the line with black construction paper, distributing it to those with normal polarity rocks.*

5. All students who are reverse polarity (negative latitude VGP) raise hands. *The teacher walks down the line and distributes white construction paper.*

6. Next, all students hold their paper in front of them, and a pattern of alternating black and white will appear. *Have them turn around and tape papers adjacent (no gaps between papers), then stand back and see for themselves the 'bar code' pattern. Alternatively, teacher can take a digital photograph of the students holding up papers, and upload it to show them.*

Wrap-up: Explain that although the rocks they have are just 'actors' the data they are labeled with are authentic data about the Earth we live on. Many individual scientists collected the data, just like each student had one piece of data. Cooperatively, they came to understand the pattern of alternating field polarities. Continue lecture after the activity relating the GPTS they made to the stripes on the sea-floor, and explain the symmetry of stripes on either side of the spreading center.

GPTS activity data sheet

This is data to use in a GPTS activity described in the GPTS activity details sheet. One row of AGE, VGP LAT and VGP LON should be written on a rock/label for each student. The student is told to determine polarity - the correct polarity is listed here (N=Normal, R=Reverse). VGP stands for ‘Virtual Geomagnetic Pole’; the VGP Lat/Lon is the location of North Geomagnetic Pole at the age listed. VGP’s with a positive latitude are in the northern hemisphere (like today’s North Geomagnetic Pole) and are normal polarity.

Data source: PINT2010 paleointensity datablase

Data points for Labels – Age is in units of ‘Millions of years ago’
Lat/Lon are in degrees

AGE	VGP LAT	VGP LON	Polarity
0.08	60.4	238.5	N
0.19	82.2	286.0	N
0.39	86.9	333.5	N
0.45	87.6	11.2	N
0.57	38.8	53.3	N
0.76	12.7	354.7	N
0.85	-82.9	156.2	R
1.03	71.1	305.5	N
1.25	-80.5	17.7	R
1.33	-88.5	238.1	R
1.56	-82.9	336.0	R
1.70	-79.9	84.9	R
1.69	68.8	299.9	N
1.80	-74.6	123.6	R
1.90	-67.5	360.0	R
2.07	-88.3	202.7	R
2.20	-82.0	336.2	R
2.35	-76.3	296.9	R
2.55	80.8	18.9	N
2.61	81.3	337.8	N
2.73	81.5	195.9	N
2.98	79.8	16.2	N
3.05	-56.7	216.1	R
3.22	86.2	305.1	N
3.33	-74.6	230.2	R
3.50	75.4	224.5	N
3.50	67.2	210.1	N
3.60	-84.8	166.9	R
3.75	-71.2	119.0	R
3.89	-62.2	8.9	R
4.00	63.8	93.9	R
4.08	-72.3	37.4	R
4.10	86.5	12.4	N
4.61	82.9	175.7	N

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