

# SEISMOLOGY WITH DR PAULA KOELEMMEIJER

## TALKING POINTS

### KNOWLEDGE

1. What are standing waves?
2. What are the characteristics of the blobs Paula studies in the mantle?
3. How do humans produce seismic signals?

### COMPREHENSION

4. How does Paula use seismic waves to 'X-ray' the Earth?
5. How can standing waves provide information about Earth's properties?

### APPLICATION

6. What questions would you ask Paula to learn about how she is determining the density of the blobs in the mantle?
7. Apart from monitoring poaching, how else could conservationists and biologists use Paula's work on elephants in Kenya?
8. If you had a seismometer in your house, what do you think it would detect? What rhythmic cycles (e.g., daily, weekly) occur in your neighbourhood?
9. Which of the many applications of seismology are you most interested in? Why?

### ANALYSIS

10. Why is it important that seismologists look for natural background seismicity in urban areas?
11. Why can small earthquakes not be used to image the deepest parts of the Earth?
12. How do you think the field of urban seismology combines social sciences with seismology? What research questions do you think urban seismologists should ask?

HEAD TO PAULA'S FUTURUM WEBPAGE FOR AN ANIMATION ABOUT HER WORK:

[www.futurumcareers.com/what-landscapes-are-hidden-deep-within-the-earth](http://www.futurumcareers.com/what-landscapes-are-hidden-deep-within-the-earth)

## ACTIVITIES

1. If you have a smartphone, download an app such as 'Vibrometer' or 'Vibration Meter' to turn your phone into a simple seismometer. Try the following:
  - a. Place your phone on a table and record the vibrations caused by shaking the table. How does the recording vary if you shake the table from side to side compared with up and down? Do you get a similar signal when you stomp the table with your fist?
  - b. If you are close to a road, (safely) measure the seismic vibrations as vehicles pass. What kind of magnitude can you pick up? Can you detect passing cars, or only large vehicles?
  - c. Are there any other places in your local area where you can (safely) detect seismic waves? Examples include sports venues, railways, construction sites or concert venues.
2. Use a slinky to experiment with different types of seismic waves. Attach one end of the slinky to a block of wood or plastic and ask a friend to hold the other end so the slinky is reasonably stretched out.
  - a. How does the slinky move if:
    - i. You hit the block with a closed fist?
    - ii. You move the block quickly up and down?
  - b. Research P and S waves, in the context of earthquakes. Which of the slinky's movements was analogous to P waves, and which was analogous to S waves?
3. Build your own seismograph. Using the instructions provided by the Incorporated Research Institutions for Seismology, construct a seismograph from common household objects and see if you can record ground motions: [www.iris.edu/hq/inclass/lesson/build\\_your\\_own\\_seismograph](http://www.iris.edu/hq/inclass/lesson/build_your_own_seismograph)

## MORE RESOURCES

- Visit Paula's website to learn more about her research and outreach activities, including 3D printed models of the Earth: [www.earth.ox.ac.uk/~univ4152](http://www.earth.ox.ac.uk/~univ4152)
- This article in EOS explains the discovery and significance of the two 'blobs' in the mantle: [www.eos.org/features/the-unsolved-mystery-of-the-earth-blobs](http://www.eos.org/features/the-unsolved-mystery-of-the-earth-blobs)
- This article from Paula in *The Conversation* discusses how seismic noise decreased during the first half of 2020, and what this meant for seismologists: [www.theconversation.com/coronavirus-lockdown-reduced-seismic-activity-around-the-world-new-study-143203](http://www.theconversation.com/coronavirus-lockdown-reduced-seismic-activity-around-the-world-new-study-143203)
- This video from Deep Look examines how elephants communicate using seismic waves: [www.youtube.com/watch?v=iYM9oXftLIQ](http://www.youtube.com/watch?v=iYM9oXftLIQ)