

Structural and energy geology

with Professor Sherilyn Williams-Stroud

Talking points

Knowledge

1. What is induced seismicity?

Comprehension

2. What is the difference between porosity and permeability?
3. How does the grain size of a sedimentary rock influence its porosity and permeability?
4. What are the benefits and drawbacks of using rock cores and seismic data to determine the characteristics of subsurface rock features?
5. In what ways do geologists support the energy industry?

Application

6. How do you think Sherilyn engages with communities impacted by energy projects? What concerns do you think communities might have about fluid extraction or injection projects, and how might these projects benefit nearby communities?

Analysis

7. Why is it important for Sherilyn to understand the nature of subsurface fractures in rocks? How can this knowledge support oil and gas exploration, carbon sequestration and geothermal power?
8. Why do you think it is important to know if an earthquake near an injection site is natural or caused by human activities?

Evaluation

9. To what extent do you think we should be investing in carbon sequestration to remove CO₂ from the atmosphere, compared to investing in methods to reduce CO₂ emissions in the first place?

Activity

In this experiment, you will compare how grain size impacts pore space and therefore porosity. You will use loose sediment (sand and gravel) to represent different grain sizes – remember that in solid rock the grains are cemented together.

You will need:

- Two identical containers
- Sand
- Gravel
- Measuring jug
- Water

Instructions

1. Measure the volume of your two containers.
2. Fill one container to the brim with sand and fill the other container to the brim with gravel.
3. Using the measuring jug, slowly pour water into the container of sand until it begins to overflow. Record the volume of water poured into the container. This water has filled the gaps between grains and so represents the volume of pore space.
4. Repeat step 3 for the container full of gravel.
5. Calculate the porosity of each container using the equation: $\text{Porosity} = \text{Pore volume} / \text{Total volume}$

Reflection questions

- How does the grain size influence the pore space and porosity? Why?
- If your containers of loose sediment were cemented rock, which would be most suitable for extracting oil or storing CO₂, and why? What other factors would impact the rock's suitability?
- And which would be most suitable for trapping oil or CO₂, and why? What other factors would impact the rock's suitability?

More resources

- This article explains how structural geology will contribute to a sustainable future: geoscientist.online/sections/features/structural-geology-for-a-sustainable-world
- The US Geological Survey (usgs.gov/educational-resources) and The Geological Society (geolsoc.org.uk/education-and-resources) provide educational resources, activities and lesson plans