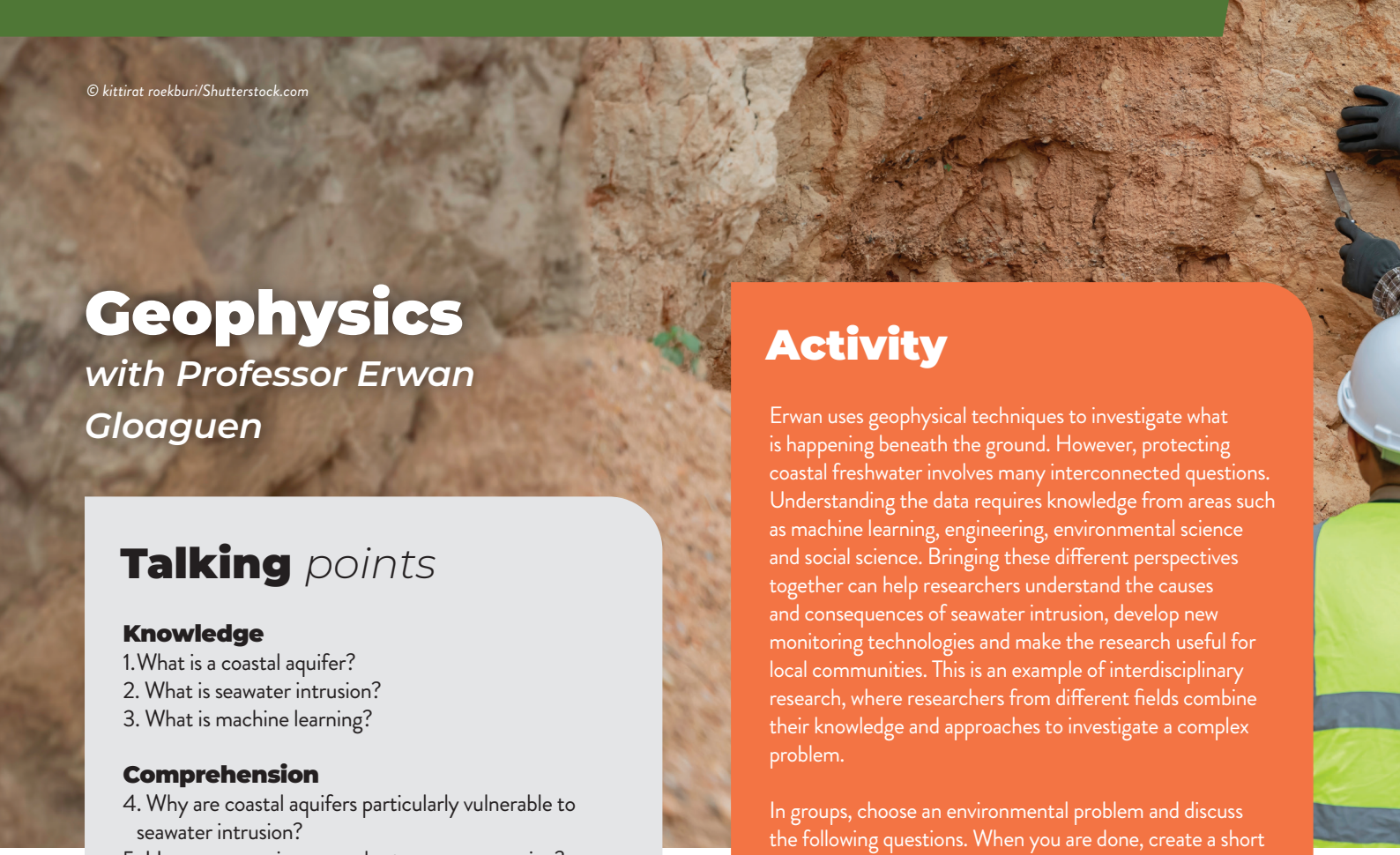


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# Geophysics

*with Professor Erwan Gloaguen*

## Talking *points*

### Knowledge

1. What is a coastal aquifer?
2. What is seawater intrusion?
3. What is machine learning?

### Comprehension

4. Why are coastal aquifers particularly vulnerable to seawater intrusion?
5. How can pumping groundwater cause upconing?
6. How do sensors and geophysical techniques help researchers monitor changes underground?

### Application

7. Imagine you are responsible for managing the freshwater supply of a coastal community. What information would you want to collect before deciding how much groundwater can be safely pumped?
8. How could the low-cost sensors developed by Erwan's team be used to help a community protect its freshwater supply?

### Analysis

9. Why might relying on data from only one source or scientific discipline give an incomplete picture of what is happening in a coastal aquifer?

### Evaluation

10. To what extent could open-source technology make coastal freshwater monitoring more accessible to communities around the world?
11. To what extent can involving local communities alongside scientists and engineers improve solutions to environmental challenges? Why?

## More *resources*

- Watch this video from UNESCO about coastal aquifers: **youtube.com/watch?v=7ZIIBMZhk64**
- Learn more about how geophysicists use different techniques to study the subsurface: **youtube.com/watch?v=gRramwK6ff8**

## Activity

Erwan uses geophysical techniques to investigate what is happening beneath the ground. However, protecting coastal freshwater involves many interconnected questions. Understanding the data requires knowledge from areas such as machine learning, engineering, environmental science and social science. Bringing these different perspectives together can help researchers understand the causes and consequences of seawater intrusion, develop new monitoring technologies and make the research useful for local communities. This is an example of interdisciplinary research, where researchers from different fields combine their knowledge and approaches to investigate a complex problem.

In groups, choose an environmental problem and discuss the following questions. When you are done, create a short presentation explaining how interdisciplinary research could help solve your chosen problem.

- What can geophysics tell us about the problem?
- What questions would geophysical measurements not answer on their own?
- Which other areas of expertise could help interpret the data or address those questions?
- How might information from different disciplines be combined to develop a more complete understanding of the problem?
- What could make collaboration between different disciplines difficult?

After you have shared your presentation with the class, take some time to reflect individually on this activity. Write a short answer to each of the following questions:

- What makes a problem suitable for an interdisciplinary approach?
- Why might collecting more data not necessarily lead to a better understanding unless different types of expertise are brought together?
- What are the advantages of starting with a specific scientific method, such as geophysics, and then bringing in other perspectives?
- How might researchers from different disciplines disagree about what information is most important?
- What can interdisciplinary research achieve that research within a single discipline might not?
- If you were the geophysicist, engineer, machine-learning scientist, environmental scientist or social scientist on Erwan's project, what questions would you ask, and what would you need from the other disciplines to answer them?