



**ocean engineering**  
**physical oceanography**

*Great Southern Science Council Pro Files series – connecting science professionals and our community*

## Carly Portch

**job title** PhD student studying physical oceanography and coastal engineering

**organisation** University of Western Australia – Wave Energy Research Centre (focus on renewable energy from ocean waves)  
[www.uwa.edu.au/facilities/wave-energy-research-centre](http://www.uwa.edu.au/facilities/wave-energy-research-centre)

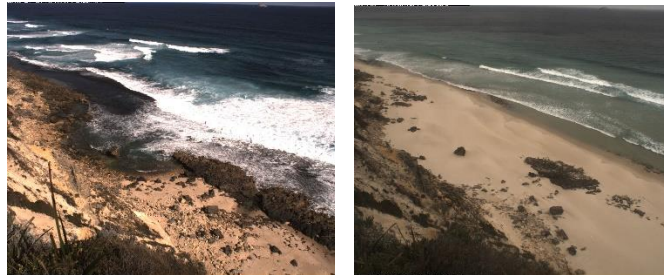
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**Pro File video interview**

Watch the Pro File video  
*Carly Portch - Ocean engineering on a rugged, dynamic coastline*  
to learn more about this STEM professional, why they chose to work in this field and their pathway to it , their typical work day, favourite part of the job, common myths about their field, and more.



Monthly drone surveys achieve beach morphology monitoring. Stitched digital images create a 3D beach model to help us quantify changes in sand volume and overall topography.




October 2019 (end of winter) \ \ March 2020 (end of summer)  
Images from the same semi-autonomous camera collecting information on beach morphology (physical shape of sand deposits) and nearshore hydrodynamics. Note the dramatic seasonal changes to the same beach from October to March, through the processes of sand erosion and accretion by wind and wave action.



Perks of wave engineering work, snorkelling! Deploying a pressure sensor to collect long-term water level data near Albany, south west coast of Western Australia.

**EXTENSION MATERIAL – science professionals answered these questions to extend your interest and study in their topic area**

<b>FREQUENTLY ASKED QUESTIONS</b> in this topic/job	<b>FAQ 1</b> Are there a lot of jobs related to the topic you're studying in your PhD that you can pursue afterwards?	Often the work during a PhD is very specific, and it is common to end up in unrelated or only partially related careers afterwards. This is ok, as the main takeaway is not just about the technical skills you gain, but also the broader underlying skills you gain from doing a PhD.
	<b>FAQ 2</b> Are you in the minority as a women in engineering/ STEM?	Throughout my career and education thus far, there is generally a larger percentage of men in the field, however there are more and more women joining STEM fields every day. I think there are huge benefits to having large diversity within a work team, and not just in terms of men and women, but also people of different cultural backgrounds, beliefs etc. This allows for broader perspectives on the wants and needs of society.
	<b>FAQ 3</b> How do you find self-motivation for a 3-year independent project?	Following your passions as you progress helps a lot. It can be quite challenging to self-motivate, but if you continuously follow the areas you are interested in, frequently remind yourself of the bigger picture and the skills you will gain from this experience, it helps keep you on track.
<b>YOUR TURN</b>	What question could you ask this person?	
<b>LEARN MORE</b> 	Carly recommends this popular <i>research journal</i> about coastal engineering:	<i>Coastal Engineering: An International Journal for Coastal, Harbour and Offshore Engineers</i> It is where many papers are published on the newest research within coastal engineering.
	Carly says this article is great.  Also, coastal engineering is important to many Western Australian government departments – here's a link to WA Department of Transport information.	For a more general description of what coastal engineering is, the following article is a great starting point: <a href="https://www.pilebuck.com/marine/basics-coastal-engineering/">https://www.pilebuck.com/marine/basics-coastal-engineering/</a>  <a href="https://www.transport.wa.gov.au/imate/coastal-erosion-and-stability.asp">https://www.transport.wa.gov.au/imate/coastal-erosion-and-stability.asp</a>

<p><b>DO MORE</b></p>	<p>A citizen science or interactive project that community can be involved in to learn more about this topic</p>	<p>The more data the better! Coastal engineers are often looking for more ways to collect data to better understand the natural beach environment and how coastlines may change over time. There are currently a few on-going projects where community members take photos of a beach they are at (from a specific look out location), and send it to coastal engineers to add to the database. Check out this project in New South Wales; while Albany does not yet have a similar program, stay tuned for developments!</p> <p><a href="https://www.environment.nsw.gov.au/research-and-publications/your-research/citizen-science/digital-projects/coastsnap">https://www.environment.nsw.gov.au/research-and-publications/your-research/citizen-science/digital-projects/coastsnap</a></p>
<p><b>INNOVATE</b> One, Two, Three...solved!</p>	<p><b>One</b> Big Problem we are trying to understand in this topic area <b>Two</b> innovative ways we are already trying to solve the problem <b>THREE</b> ideas for the problem solving wishlist that anyone could help develop</p>	<p><b>1</b> Big Problem: Ability to track the water line along the beach in photos without having to manually digitize every image as the water line moves.</p> <p><b>2</b> Existing ideas: Computer vision/ deep learning techniques to teach the computer how to detect the water line OR using the motion of the water against the stationary beach to identify the water line. One of my papers will likely investigate different existing methods for tracking waterlines autonomously, and finding a method that works best at our field site.</p> <p><b>3</b> More ideas: Anyone interested in combining computer science with coastal engineering can help us extract useable data from images. Tracking the water line is just one example I am working on, but there are many other problems to tackle such as finding ways to remove water droplets from images, or removing shadows that appear from clouds or nearby trees.</p>
<p><b>YOUR TURN</b></p>	<p>Using your new insights for this topic and its issues, please add another idea for the Problem Solving Wishlist. Then think of a research question to test possible solutions. <i>eg Idea: brainstorm some reference points and some "yes/no" questions a computer would need to ask to detect differences between images of an ocean beach</i></p>	

<p><b># CURRICULUM LINKS #</b></p>	<p><b># The Energy transfer through different mediums can be explained using wave and particle models #</b></p> <ul style="list-style-type: none"> <li>exploring the properties of waves, and situations where energy is transferred in the form of waves, such as sound and light</li> </ul> <p>Carly's research focuses on changes in our shorelines in response to the energy of the oceans. Is there a beach near you that changes from season to season? Or where the coastline is changing over time? Describe this place. If you live far from the ocean, or if you can't think of anywhere suitable, choose your field site from this resource <a href="https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_CoastalErosionHotspotsInformationSheet.pdf">https://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_CoastalErosionHotspotsInformationSheet.pdf</a></p> <p>Research processes such as longshore drift, sea-level rise in response to climate change, coastal erosion, and seasonal changes in the prevalent wind directions.</p> <p>Can you use this information to explain the seasonal changes in your chosen study area?</p>
<p><b>INFLUENTIAL OCEANOGRAPHERS</b></p>	<p>Did you know that plate tectonics was a controversial theory as recently as the 1950s? Do some research to discover some of the reasons that people did not believe in plate tectonics. How did scientists who believed in plate tectonics argue against these reasons?</p> <p>Read about the life of Sylvia Earle at <a href="https://en.wikipedia.org/wiki/Sylvia_Earle">https://en.wikipedia.org/wiki/Sylvia_Earle</a> and learn about her using two other resources.</p> <p>What do you think is the most impressive of her many achievements? Which do you think will be the most long-lasting legacy that she leaves? Are your two answers different? If so, why do you think that is? You will have noticed that she was the first woman to do many things. Think of some challenges faced by women in oceanography today, and compare those to the challenges faced by Sylvia Earle.</p>
<p><b>KNOWLEDGE + IMAGINATION</b> What will it be like?</p>	<p>Coastal engineers look after the interface between the land and ocean, and try to ensure that land-based structures stay safe. As sea levels rise, this job will become more important in the future.</p> <p>Do some research to find out how to become a coastal engineer. What kind of qualifications do you need? How long do you have to train for? What kind of places might you be able to work in?</p>

**OUR PATCH**  
**PHYSICAL**  
**OCEANOGRAPHY AND**  
**WAVE ENERGY**  
**IN THE GREAT**  
**SOUTHERN**

One reason Carly is studying her PhD in Albany relates to learning more about the dynamic coastal processes that make the the south coast region a great place to harvest wave energy.

A physical oceanographer would be able to help with the harvesting of wave energy. Consider aspects such as the siting of wave energy capture devices, the need to plan for extreme weather, and the need to make sure that sea creatures and coastal processes are not negatively impacted by the devices. Do some research on one or more of these aspects, and use your knowledge of the Albany region to identify the major challenges for a physical oceanographer in this job.