DEEP-SEA SCIENTIST SPOTLIGHT

JOHANNA WESTON

DEEP-SEA ECOLOGIST & TAXONOMIST

Dr. Johanna Weston is a postdoctoral investigator at Woods Hole Oceanographic Institution in Massachusetts, USA. She earned her Bachelors of Science from the University of Dallas, her Masters from California Polytechnic State University, and her PhD in Marine Science from Newcastle University. Her research focuses on where organisms live, the diversity of marine species, and adaptations to deep-sea environments.

What do you study? What kinds of techniques do you use in your research?

I am a deep-ocean ecologist with a passion for benthic invertebrates. My research aims to understand **how biodiversity and connectivity influence ecosystem resilience in the deep ocean**—an environment that provides critical ecosystem services but remains understudied—and is increasingly threatened by climate change and human activities. I focus on the ecological connections between fragmented, island-like habitats, such as hadal trenches, and hydrothermal vents, both active and inactive. To do this, I use **amphipods**, a highly diverse and abundant crustacean order, as a model system to understand how the environment influences community structure and drives genetic connectivity, how past environmental conditions shape diversity and distribution, and how human activities impact the deep ocean. To address these pressing questions about marine biodiversity at various scales, I integrate principles from multiple fields, including **taxonomy, ecology, natural history, geosciences, and engineering**, and utilize cutting-edge tools such as deep-ocean vehicles (like the human-occupied submersible Alvin) and genomics. I have been fortunate to participate in six deep-ocean expeditions, dive in Alvin, publish papers about amphipods in all five oceans, name five new species (including two new genera), and build a novel zooplankton sampler called DeepZoo.

What made you want to become a scientist? How did you find your field?

Many in my family are scientists, engineers, and travelers, so I was exposed to STEM early on. One of my grandfathers was an exploratory geologist, spending months in the backcountry searching for potential sites for future nickel and copper mines. When I visited him, we went hiking in the mountains, and he taught me a great deal about rocks and geology. Also, my parents took my siblings and me to natural history museums. This early exposure to the outdoors and museums shaped my passion for the animals and places I study – with both a strong appreciation for exploration and the rich resources that museums offer.

I discovered my research field by **serendipity**! After earning an MSc at California Polytechnic State University, San Luis Obispo, I almost pursued a PhD at the University of Hawai'i for a PhD on hadal ecology. But life said it wasn't the right time to leave California. Fast forward a few years, and I was ready for a PhD. For my husband's new job, we relocated to Newcastle upon Tyne, and I discovered a PhD program. Surprisingly enough, Alan Jamieson, one of the few hadal scientists in the world, became my PhD advisor. It was a moment of full-circle opportunity!

Is there a research project, moment of discovery, or science experience that you're most proud of being a part of?

Great question! I am very proud of my research because it requires a lot of work to make it public. Every time a research project is fully completed with a published manuscript, it feels like a victory and a minor miracle! However, if I have to pick one, it would be the discovery of *Eurythenes plasticus*. *Eurythenes plasticus* is an amphipod that lives between 6,000 and 7,000 meters deep in the Mariana Trench. This species is special for several reasons.

For me, it holds particular significance as the first species I described and named. It also has a big story for us. *Eurythenes plasticus* was named for something it accidently ate – microplastic. *Eurythenes plasticus* demonstrates that plastic pollution is ubiquitous and that depth doesn't protect deep-sea animals from human impact. It is a sad message, but it resonated with people. After the paper was published, people from around the world began discussing *Eurythenes plasticus* and even creating artwork featuring this amphipod. *Eurythenes plasticus* is now featured in several museums, has received a Guinness World Record, and has contributed to a UN resolution aimed at combating plastic pollution. *Eurythenes plasticus* taught me that people care and want to learn about the deep ocean and that every species has the potential to tell a powerful story.

What was your first science experiment?

What a fun deep dive into memories! My dad worked in R&D for Dow Chemical, and I recall one year his office held a family open house night. As a six-year-old, I remember how **we made silly putty**, wearing all the safety gear—goggles, gloves, and a lab coat. Looking back, it wasn't a rigorous experiment, but I loved seeing my dad's work and the wonder of mixing chemicals to create something new.

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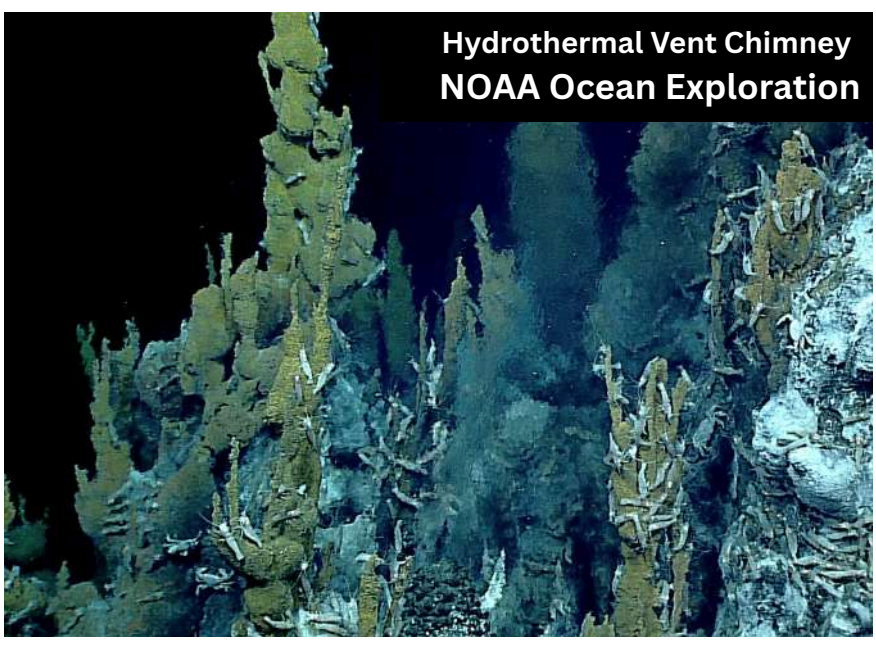
Why is it important to study the deep seas? What motivates you in your work?

Earth is deep ocean! It makes up over 50% of the Earth's surface. Countless unique species, many of which remain unnamed, call the deep ocean home. The deep ocean is seemingly far away because it is logically and engineering challenging to reach.



Hydrothermal Vent Chimney
NOAA Ocean Exploration

However, the deep ocean is close and tightly connected to us on land. Studying it helps us understand **how the ocean stores carbon** and regulates Earth's climate. It also holds clues to groundbreaking **medical and scientific discoveries**, including new medicines and life in extreme environments. As interest in deep-sea mining and other industries grows, research is vital to **protect these fragile ecosystems** before they're impacted. I am motivated to explore the unknown and share the fascinating stories of some of the amazing animals and habitats that help us better understand our planet and how to care for it responsibly.

ADVICE & LESSONS FROM DR. WESTON

Other than your studies in Marine Biology, what life experiences, course work, or other jobs you've held helped you build skills that you use to study the deep oceans?

My undergraduate degree is from the University of Dallas, a small liberal arts university near the former Dallas Cowboys stadium. At that time, the Biology Department was small and primarily focused on pre-med, so I didn't take many environmental biology courses. However, I took a wide range of writing-intensive courses in English, History, and Politics. Many people enter STEM thinking it offers an escape from writing, but STEM involves a significant amount of **writing**! For this reason, I am now grateful for all those term papers. Another position that has equipped me with skills for deep ocean science is my work with the State of California. I served as an environmental scientist for the State Water Resources Control Board for three years, where I developed several policies aimed at protecting water quality. One policy focused on limiting trash, specifically plastics, from entering California's streams, lakes, and ocean. Developing policy was an exciting process that, at times, proved challenging. It required balancing the needs of various stakeholders, including industry, NGOs, and municipalities, to maintain clean water boards. Throughout the policy development process, I collaborated with some excellent lawyers and learned the significance of word choice.

Clarifying Misconceptions

One misconception is that you must live by the ocean to learn about or study the deep ocean. Not true! The Earth consists of a deep ocean. Therefore, regardless of your location, you should be able to learn about it. Deep ocean expeditions are one method to study this aspect of the ocean. However, **just because you haven't been to sea doesn't mean you can't analyze deep ocean data**. A significant amount of unanalyzed data is accessible through ROV dives, museum collections, and public databases. Processing deep ocean data can be done almost anywhere, even in landlocked areas.

My Advice to Future Scientists

Stay curious. Select a topic, such as an animal group, habitat, or data type, that captivates you. Make it your mission to **share the wonder** and awe of this topic with the world.

Before I began my PhD, I didn't know what an amphipod was. However, when presented with numerous samples from various locations, I recognized that they had incredibly special stories to tell about life in the deepest parts of our planet. While some people perceive amphipods as unattractive, I find many of them to be quite beautiful and even cute. Early in my PhD, I decided to embrace my love for them and enjoy every setae that I draw while describing a new species.

For more on Dr. Weston's work, visit:
https://directory.whoi.edu/profile/johanna-weston/

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