DEEP-SEA SCIENTIST SPOTLIGHT

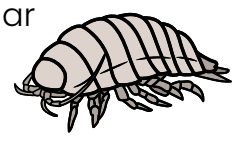
ANGELIKA BRANDT

POLAR DEEP-SEA BIODIVERSITY EXPERT

Dr. Angelika Brandt is a world-renowned deep-sea and polar researcher at the Goethe University and Senckenberg Institute in Germany. Dr. Brandt earned her doctorate in 1992. She then joined the University of Hamburg faculty as a Professor of Special Biology in 1995, where she later served as the Deputy Director and Director of the Hamburg Zoological Museum. Professor Brandt now leads the Department of Marine Zoology at the Senckenberg Research Institute and National History Museum Frankfurt in addition to serving as a professor at Goethe University Frankfurt, where she shares her expertise in research, mentoring, and teaching. Much of her work focuses on isopods, an important and diverse group of marine crustaceans. Professor Brandt was recently honored with the 40th International Prize for Biology by the Imperial Highnesses of Japan, one of the world's highest honors in biology, for her contributions to global understanding of biodiversity.

What do you study? What makes this research important?

Right now, I work on deep-sea and polar areas, but mainly deep-sea systems. My research field has developed through my scientific life, over **more than forty years**. In former times, in fact, I wanted to become a teacher. I studied education for a diploma, but became more and more fascinated by arthropods, especially in the marine realm. So, it had to be crustaceans. That is the reason why I try to understand the composition of crustaceans in deep-sea and polar areas. **Arthropods** are so ubiquitous, with many species occurring at many places. They are quite good model organisms to work with.



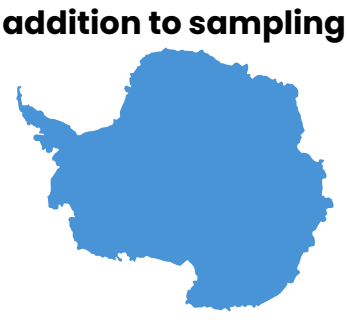
What made you want to become a scientist? How did you find your field?

Well, my research has slowly developed throughout my career. My plan was to become a teacher. I studied biology and English to teach high school, but I was more fascinated during my studies in biology by marine organisms. I was always fascinated by underwater video footage from Jacques Cousteau, for example, and others.

And maybe this influenced my decision to work with crustaceans. In my early studies, I studied **sensory organs of crustaceans** that occur in shallow water. My former supervisor was offering courses for becoming a research diver! And this was always my ultimate dream to be able to dive in the in the open ocean and see the animals myself. This was a very convincing reason, in fact, to work in that working group on isopods, and I still work with isopods. Then, during my further studies, I was attracted by Arctic and Antarctic research. I got the opportunity to work on a polar project on biogeography, studying the distribution of organisms. The Antarctic is a very interesting evolutionary laboratory because although the shallow shelf is isolated, the Antarctic deep sea is open to all other oceans. I did biogeographic work for my thesis, which was dealing with the **origin of isopods and Antarctica**. My work focused on which species remained after the disintegration of the ancient supercontinent Gondwana, and which ones maybe conquered Antarctica anew.

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

That is in fact the Southern Ocean deep-sea research of the *ANDEEP project* (**Antarctic deep-sea benthic biodiversity: colonization history and recent community patterns**), which I initiated because of the sampling gaps on the biogeographic map around Antarctica. The motivation came from papers dealing with deep-sea biodiversity that reported a decrease in the number of species present from the tropics to the poles. These studies described a decrease in species richness with increasing latitude, but the southernmost samples for investigating these latitudinal gradients were around 40°S in the Argentine Basin. No more stations farther South were ever sampled. Because of these studies and also the background of my PhD thesis, **I decided that, in addition to sampling the Arctic, we had to go to the Southern Ocean deep sea and sample there.**



To make this project happen, I wrote to many people around the world and got 25 very good supporting letters, which helped when we applied for ship time. We received the ship time, in fact, and were able to do three expeditions, two in 2002 and one in 2005. Based on the data that had been published, including in Nature in 1993, we expected that we would find interesting material in the Southern Ocean, but a low diversity of organisms. We found the absolute contrary! So that was very astonishing for all of us, and nobody expected it. And **we were also astonished about the wealth of new species from almost all taxa.** The organisms that live in these polar habitats will be dealing with an with extreme warming effect from climate change, that we are witnessing now.

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

The deep sea is the largest ecosystem on Earth. More than 70% of Earth's habitats are in the deep sea, and 60% of habitats are below 1,000 meters. Most of what we know about marine organisms— and most of the species that have been described—are from the upper surface shallower than 200 m, as we have seen from the Census of Marine Life and the Challenger 150 program of the United Nations Ocean Decade. We do not know much about the deep sea, making the deep sea important to study.

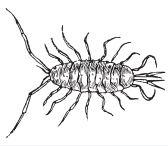
Many deep-sea habitats are geologically very old and include the oldest ocean floor on our Earth in the Pacific. Organisms have been evolving in the ocean for a long time, and these habitats have quite a high biodiversity. There are estimations that 50 to 80% of all biodiversity on Earth lives in the ocean, with high diversity in the deep sea. It is likely that 90% of marine taxa are actually unknown in the deep sea. If we want to understand how the ecosystem functions, then we just need to study these places.

We find so much unknown biodiversity when we study the deep sea. During recent expeditions to study the hadal zone, we have sampled a lot of new species. Interestingly, there is a high connectivity within the trenches. Sometimes, a species living in one side of the Pacific, such as the Aleutian Trench, is even genetically identical to the species living across the ocean in the Kuril-Kamchatka Trench or Japan Trench. This is just amazing, showing that these deep-sea trenches are in some way interconnected!

We also need to know which species live where to understand potential changes.

What was your first science experiment?

I studied how crustaceans sense the world around them, using microscopy to understand chemical and mechanical sensory mechanisms.



ADVICE & LESSONS FROM DR. BRANDT

NOAA Ocean Exploration

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?

I always wanted to become a teacher. And I am a teacher now. I'm a professor at a university. The pathway to my position that I have now, was very winding. I originally studied to teach children, and I believe these skills that I developed taking education classes help me communicate the importance of the oceans today. In school, I had the opportunity to study. I got so excited after my first experiences studying the oceans that I decided to continue.

Clarifying Misconceptions

It is important to focus on the function of the ecosystem. When studying biodiversity, we need to think about not only the high-level taxonomic groups we see, but what traits specific traits the animals have and what species are doing in the environment. The way an organism swims, grows, burrows, feeds, and avoids being eaten all matter. We must identify species but also understand how they are interacting with the environment. This functional work is challenging, but very important.

My Advice to Future Scientists

Internationally, **we need to improve collaboration** and to do this wherever it is possible. During financial crisis and difficult times, it is more and more difficult for a scientist to get research grants. There will be more and more pressure to put money together for larger, international, multidisciplinary projects. I think that is very important. It is also important to **publish our data open access** when possible, including making metadata available. We need to make it as easy as possible to share data open access. In difficult times like now, **we need to work together,** we need to improve international collaboration, wherever possible.

For more on Dr. Brandt's work, visit:
https://scholar.google.ch/citations?user=oQaVrTIAAAAJ&hl=de

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