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Synergy: Katie Shamberger, Alice Alpert and Hannah Barkley

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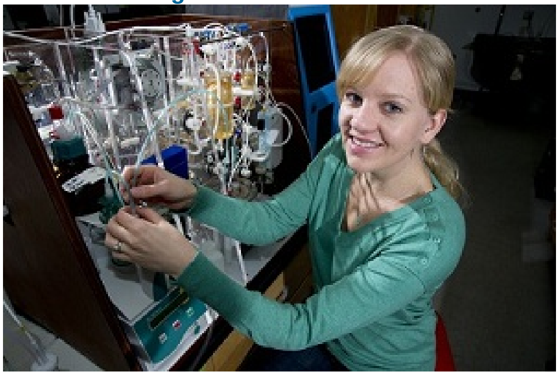
Katie Shamberger



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WHOI postdoctoral researcher Katie Shamberger makes adjustments to VINDTA (Versatile INstrument for the Determination of Total inorganic carbon and titration Alkalinity) in the lab of associate scientist Dan McCorkle. By making fine measurements of those two parameters (dissolved inorganic carbon and alkalinity), the instrument allows Katie to precisely calculate seawater pH and CO2 levels in seawater. (Photo: Thomas N. Kleindinst)

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Katie Shamberger (left), Pat Lohmann, and Sean Kilgallin deploying a McLane Remote Access Sampler (RAS) on a coral reef in Palau. The RAS collected water samples every 2 hours for 4 consecutive days on multiple coral reefs in Palau. Katie sends the water samples back to WHOI and analyzes them on the VINDTA (see picture of Katie in the lab above) in order to calculate pH and CO2 levels in seawater. (Photo: Hannah Barkley)

Ocean Acidification and Coral Reefs

Human activities, such as burning of fossil fuels and deforestation, have driven a marked increase in atmospheric carbon dioxide (CO_2) that is affecting global climate. Excess anthropogenic CO_2 also mixes into the surface of the ocean, causing a decrease in seawater pH, a process known as ocean acidification. Ocean acidification threatens coral reefs because as seawater pH decreases, it becomes more difficult for coral reef organisms, specifically corals and calcareous algae, to produce the calcium carbonate skeletons that make up the reef structure. My research focuses on understanding and quantifying coral reef ecosystem responses to global warming and ocean acidification.

Katie and Synergy

I chose to participate in Synergy because effectively communicating science to other scientists, students, the public, and policy makers is crucial for making sure important research results have the highest possible impact on society. It is critical for the public and policy makers to understand the imminent threats of ocean acidification, a global problem caused by human carbon dioxide emissions, so there will be a strong motivation to change the status quo. I am excited about new and creative ways to communicate science and am therefore very happy to be participating in Synergy.

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A McLane Remote Access Sampler (RAS) collecting water samples for seawater CO2 analyses on a coral reef in Palau. (Photo: Pat Lohmann)

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&#0187 Katie is collaborating with Joseph Ingoldsby.

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Alice Alpert (Photo: Elizabeth Luebben)

Alice Alpert

Climate History

I am a second year PhD student in the Geology and Geophysics Department at WHOI, and my favorite part about my work is that it is not confined to one scientific discipline. I study what the chemistry of coral skeletons can tell us about the ocean in the past. This is analagous to using tree rings to reconstruct past climate on land. Specifically I am interested in El Nino in the Pacific Ocean and how it might be changing due to climate change. Because I use coral skeletons to reconstruct climate in the past, my work is inherently grounded in biology. However, I am using geochemical analyses as a tool to reconstruct past climate with the ultimate goal to understand physical processes in the climate system. So I am working at the intersection between biology, geochemistry and climate physics.

Alice and Synergy

I am excited about the *Synergy* project because I love to talk about my research and science in general with non-scientists, and art can convey ideas in a way that other media cannot. *Synergy* is an opportunity to think about the guiding concepts in my field from different perspective and engage with an artist to create something that neither of us could do alone.

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Hannah Barkley

Corals, Climate Change and Conservation

My research focuses on climate change impacts to coral reefs - specifically the effects of global warming and ocean acidification on corals - and the development of conservation strategies to address these threats. As the concentrations of greenhouse gases in the atmosphere continue to rise, this will likely have catastrophic effects on coral reef ecosystems. First, increases in ocean temperature that accompany a warming planet break down the

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Hannah sorting corals that she collected in Palau. (Photo: Ann Cohen)

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Hannah drilling a coral in Palau. This process is similar to a biopsy - one extracts a column of skeleton from the boulder-like coral, leaving the remaining coral intact. Coral cores are used to examine the chemical record of coral growth contained within the coral skeleton. (Photo: Alexi Shalapyonok)

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&#0187 Hannah is collaborating with Joseph Ingoldsby.

delicate symbiosis that exists between corals and their photosynthetic algae. This process, known as coral bleaching, has already decimated many reefs worldwide. Furthermore, the dissolution of carbon dioxide in the ocean drives down the pH of surface waters, which in turn decreases the availability of carbonate ions that corals use to build their skeletons and ultimately construct reefs. The prognosis for reefs is humbling, and even conservative estimates predict that few healthy reefs with outlast the end of this century. In light of these threats to corals, my research seeks to find a solution to the current coral crisis; I am working to identify factors that may make reefs resistant or resilient to these threats and to use this information to develop effective conservation policy. As bleak as the future may seem for coral reefs, it is my hope that my research can work to protect these staggeringly beautiful and yet despairingly delicate ecosystems.

Hannah and Synergy

I am participating in Synergy because I believe that science, especially the study of coral reefs and climate change, must transcend the traditional bounds of academia if we are to make much progress in protecting these threatened ecosystems. I've found that communicating research findings to non-scientific audiences can be extremely difficult, and so I am intrigued by the possibility of representing complicated scientific concepts in novel art forms.

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