# Bridging the Gap:
## Using Science Communication to Build Empathy and Understanding for an Imperiled Ocean

Katherine Irving, Macalester College
*Susan von Thun, Madison Pobis*
*Summer 2021*

### Introduction:
MBARI is one of the leading research institutions in ocean science, and specifically in the deep sea. This gives the institution a unique opportunity to not only educate others, but to inspire them to take action and save the oceans MBARI has been researching. The ocean may seem immutable and constant on the outside, but recently human activity has thrown many of its complex systems into disarray. Researchers have estimated that the ocean has taken up around 38% of humanity's carbon emissions in the past two centuries (Rackley 2010), and this has had a massive impact on the unique organisms and ecosystems under the surface. If scientists, policymakers, and citizens do not act soon, the ocean's incredible biodiversity may soon be lost.

In a decade in which climate decisions will shape humanity's fate for centuries to come, the field of science communication is becoming incredibly important. Environmental protection and belief in climate change have become more partisan in the past forty years, making any effort to pass protective legislation more difficult (Hopkins 2014). American's trust in science has actually increased since 2016, but the gap between Democrat's confidence in scientists (43%) and Republican's confidence in scientists (27%) is a 5% increase from 2016 (Funk et al 2019). This increasing level of partisanship among educated people reflects the failure of the Deficit Model, which many people outside of the science communication field continue to believe in. The Deficit Model is summed up by the phrase "If they only knew what I knew, they would think how I think." However, research has shown that the Deficit Model is inaccurate. In fact, a study in Nature found that with increased numeracy, or ability to understand quantitative information such as scientific data and research, people actually became more polarized, meaning that they used quantitative information selectively to reinforce their existing beliefs (Kahan et al 2013). This close-mindedness is exactly what needs to be avoided if humanity is to successfully combat climate change, and save the oceans from potential peril.

### Planning:
To create communication projects that convince a reader to think more analytically about their own values, a rhetorical triangle must be implemented. The rhetorical triangle was originally coined by Aristotle, who designated three points (Pathos,

Ethos, Logos) around which an argument's message should be crafted. For science communication purposes, these points were changed to Speaker, Audience, and Purpose, as shown in Figure 1.

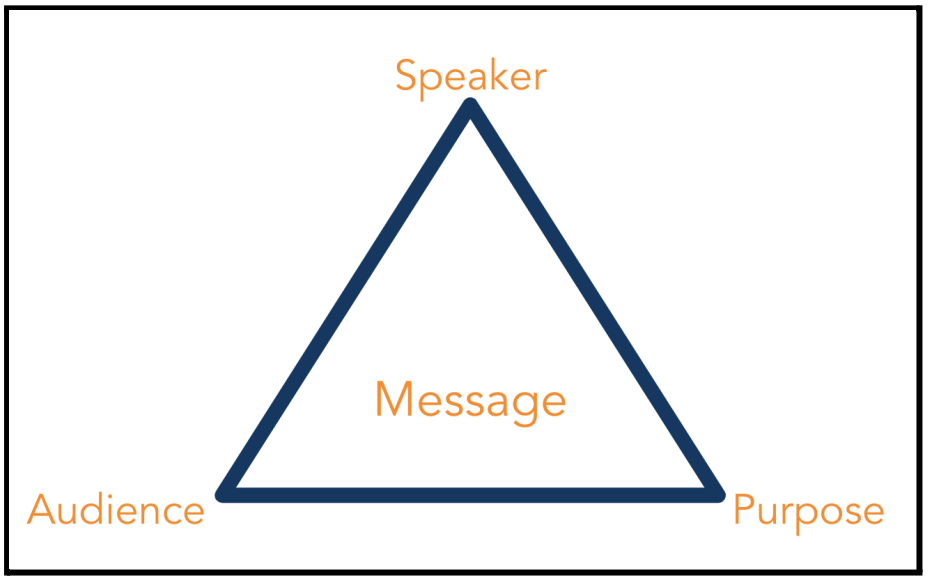



**Figure 1:** The three modified points of Aristotle's rhetorical triangle, in which one must appeal to all three points of the triangle in order to present a convincing argument. The top point is an appeal to ethos: what authority one has a speaker to be discussing the subject at hand. The bottom left point is an appeal to pathos: why should the audience care about the argument, and how the argument is tailored specifically to them. The bottom right point is an appeal to logos: why is the content important, and what facts and logical statements back up the argument.

The speaker point encourages the communicator to establish authority: what is giving them credibility to speak on the given subject. A good example of this would be "Trust me, I'm a doctor." The communicator is attempting to win the audience's faith through an appeal to their own credibility. The audience point reminds the communicator to tailor their argument to a chosen demographic. Why should this audience in particular care about the issue put forward, and how does that issue apply to them specifically? The communicator must always have a specific audience in mind during their appeal: the way they would pitch electric cars to a green fiend would be very different than to someone on their way to a vintage car show. Finally, the purpose point is where the communicator can get to the meat of the appeal. What is the desired outcome: what do they want their audience to do or feel? A science communicator takes all three of these points and uses them to craft their message.

The two science communication projects furthered during the ten week internship shared the same speaker, MBARI, but differed in their intended audience and purpose. The first project, a YouTube video in MBARI's Weird and Wonderful series, was meant for a more general, science-loving audience, with the purpose of building empathy for its subject anglerfishes. The second project, a landing page that would

compile visuals and information about ocean carbon, had a slightly more specific audience, and the purpose of spreading awareness for complex ocean systems and calling attention to the dangers of human emissions and ocean acidification. The rhetorical triangles for each can be seen in Figure 2.

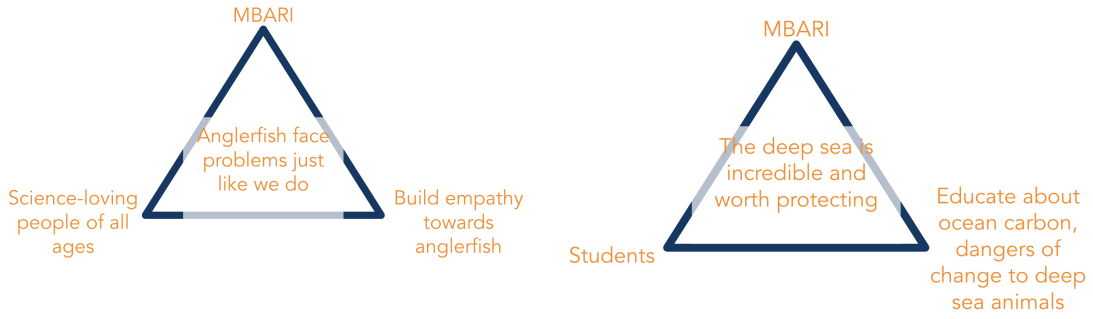



**Figure 2:** The rhetorical triangle used for Project 1 on the left and Project 2 on the right. Each had different audiences and purposes, which led to different messaging.

## Challenges:

While the ocean carbon landing page infographic included information about all levels of the ocean, the main focus of both that article and the Weird and Wonderful video was the deep sea. As previously stated, MBARI has a unique opportunity to change people's perception of the deep sea, but there are some challenges that are unique to communicating about that area in particular. In general, people are much less connected to and empathetic towards the deep sea, despite it being the largest ecosystem on the planet. Researchers have hypothesized a number of reasons why this might be the case: thalassophobia, a fear of the deep and dark that is both primal and cultural, a lack of visible geological beauty, and more, but the two addressed in the projects completed in the summer of 2021 are the accessibility of the deep sea and the lack of traditionally "adorable" famous deep sea creatures (Jamieson et al. 2021).

The first of these issues, accessibility, is the idea that the deep sea is hard to research and therefore remains a mystery to the majority of people. For researchers at MBARI, the deep sea is visible right out of the window of the office building, so it may not seem so far away. However, even for marine scientists, conducting research on the deep sea can be difficult. MBARI engineers have spent careers honing technologies that will get good footage of deep sea activities and capture live specimens, but some deep sea behaviors and interactions still remain largely a mystery. A scientist studying anglerfishes would be lucky to get a glimpse of one once every couple of months, and getting footage of them feeding or reproducing would be nothing short of a miracle. Deep sea animals are much more difficult to care for in an artificial setting, which has prevented most aquariums from housing them until now, with the upcoming launch of the Monterey Bay Aquarium's deep sea

exhibit (BBC 2012). Because of this, most people will never see a living deep sea organism in person, their only interaction with them filtered through their computer screen or the pages of a book or magazine. This lack of direct connection to the deep sea (no one is going to the deep sea on vacation) makes it harder for people to connect with it, and harder to imagine that a person's actions on land could hurt something living so far away.

The unfortunate inaccessibility of the deep ocean ties back with some of the other causes of the disconnect. The deep sea suffers the misfortune of being at the bottom, rather than at the top, of the Earth. There is a reason why there are people who desperately want to travel to space, but far fewer who desperately wish to travel to the bottom of the ocean. This is because humans attach subjective meanings to spatial orientation. In Western culture, "down," is generally a bad thing (Lakoff and Johnson 1980). A "drop" in sales, productivity, or morale is unwanted, as is a "descent" into madness, slobbishness, etc, whereas a promotion, a rise, or an ascent are all generally considered positive. Hell is at the bottom of the world, heaven is at the top. It certainly does not help the deep sea's case that there are zones labelled "hadeal" and "abyssal," both of which allude to the mythological world of the dead (Jamieson et al 2021).

The fear-inducing aura of the deep sea is not helped by the appearance of its most iconic species. While animals such as anglerfishes and fangtooth fish are

**Figure 3:** The black sea devil (left) and the fangtooth (right) are not the most traditionally adorable animals.

certainly memorable, they are not what one would call traditionally adorable. If a conservationist were to use the black sea devil as the new poster child of their "save the ocean" campaign, it would likely elicit a very different response than if they had used a baby sea otter or polar bear. Due to their unfriendly faces, anglerfishes have often been villainized in popular media, the most famous example being the anglerfish in Pixar's *Finding Nemo*. The lack of other animals or objects in the video frames of the deep sea can also make animals appear much larger than they actually are, increasing the fear factor. The black sea devil in Figure 3 is only a

couple inches long, but since there are no other creatures or landmasses in the background it's impossible to accurately gauge scale. This combination of an alien-looking appearance and an unflattering media portrayal can prevent people from feeling empathy for deep sea animals, making it harder to convince them to take action to conserve them.

These big challenges to building empathy and understanding for the deep sea were taken into account when creating MBARI's science communication projects.

### Project 1: Weird and Wonderful video on anglerfishes

The first project of the summer was a video for MBARI's Weird and Wonderful series on YouTube, which captures the most interesting facets of deep sea animals in short minute and a half long videos. For this, the MBARI team chose anglerfishes as their subject of choice, which was exciting considering their popularity. This project had a clear structure: the accompanying Creature Feature article had already been drafted, and the script of the YouTube video was meant to blend well with the content that had already been written.

As written out in the rhetorical triangle outline in Figure 2, the goal of the Weird and Wonderful video was to make the anglerfish seem relatable in order to build empathy. To make this happen, the video script needed to frame the anglerfish in a way that would make its behaviors and way of life seem similar to that of a human. It was decided that the theme of the video could revolve around the Olympics, as the video would be released around the time that the Tokyo 2020 Olympics would be airing. With an average of 26.7 million people tuning into NBC for the Rio 2016 Olympics (Deggans 2021), it was safe to assume that most of those people were not aiming to become Olympians themselves, and instead were probably watching the event from the comfort of their own couch. From there, the video's tagline "The anglerfish is a couch potato's hero" was born. The aim was to make the anglerfish seem like the average Joe, who wouldn't want to do a lot of work if they didn't have to. Rather than doing Caeleb Dressel's 50m freestyle sprint to catch a meal, the anglerfish would merely set out some bait and wait for food to come to her. Lines such as "pursuing prey isn't always worth the calories" and "the anglerfish proves you don't have to be an Olympian to get your dinner" back up the comparison made in the tagline.

### Results:

The video was published on August 3rd and received above average viewership, with over 28,000 views across platforms as of August 11th. Not only was its viewership impressive, the video was picked up by the Monterey Bay Aquarium and popular news sites Nerdist and Yahoo!Life. The article used by both Nerdist and Yahoo!Life referenced the "couch potato" tagline, as did many of the comments received across social media platforms.

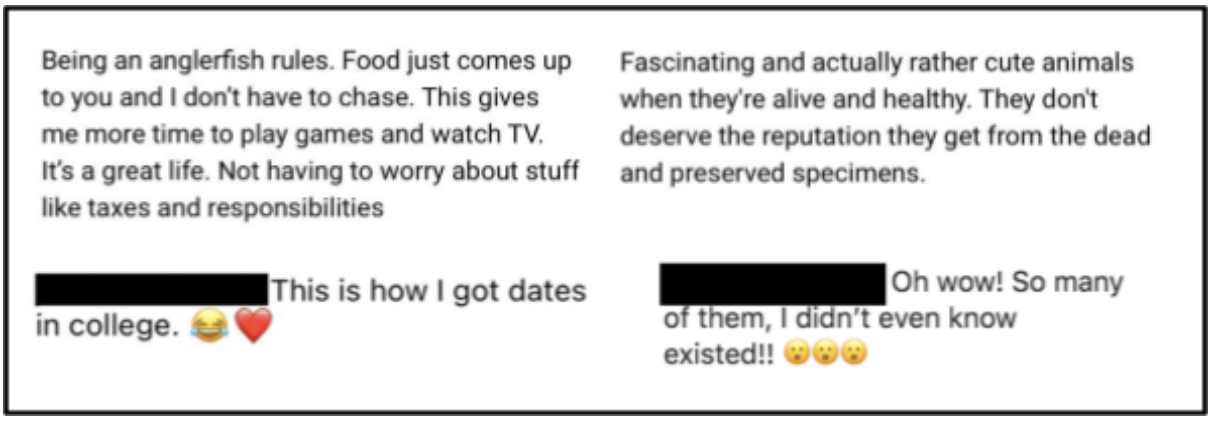



**Figure 4:** Comments from MBARI's YouTube (top left and right) and Instagram (bottom left) pages. The comments on top and bottom left display a remarkable use of empathy: the commenters are taking their own life experiences and dreams and relating them directly to the couch potato frame used in the video. The comment on the top right is notable for its use fo the word "cute," which is rarely used to describe anglerfishes, and the bottom right comment is notable for displaying the educational power of the video as well.

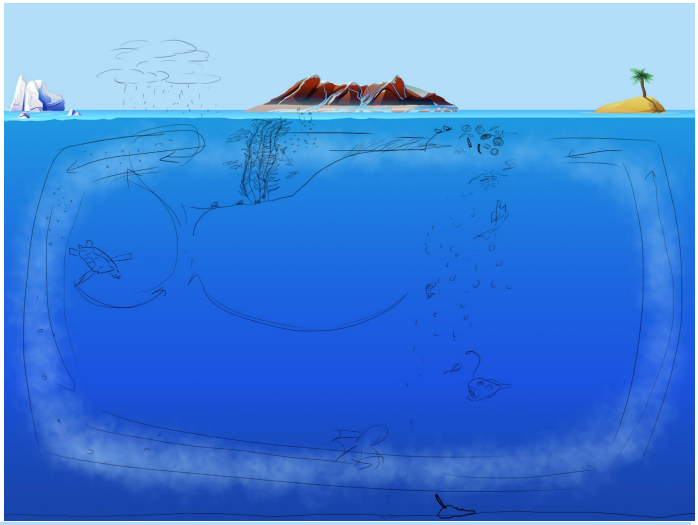
It was particularly exciting to see that people were engaging directly with the "couch potato anglerfish" frame, using their own couch potato dreams and life experiences and relating them back to the script from the video. There were comments saying they'd never seen such variety in anglerfish, and that some of the species were actually quite cute. It was incredible to see that, with proper framing, a group of animals previously portrayed as scary could actually be thought of as adorable. With such success in this anglerfish video, there is proof that science communication can do a lot to change the public's preconceptions of the deep sea, and the flora and fauna that dwell within it.

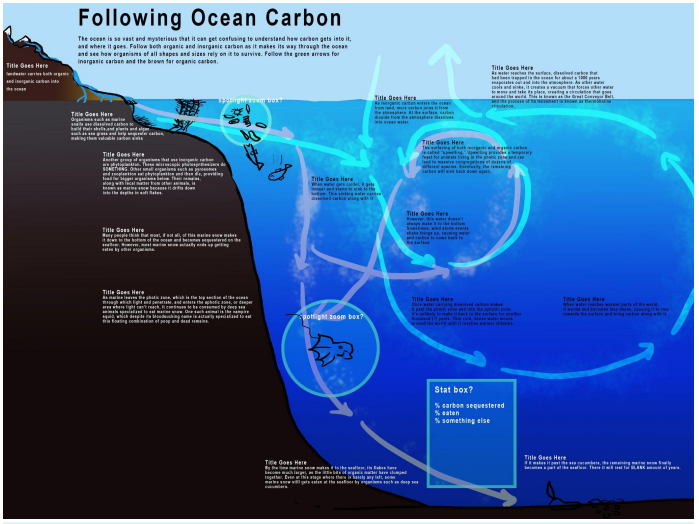
### Project 2: Ocean Carbon Landing Page Content

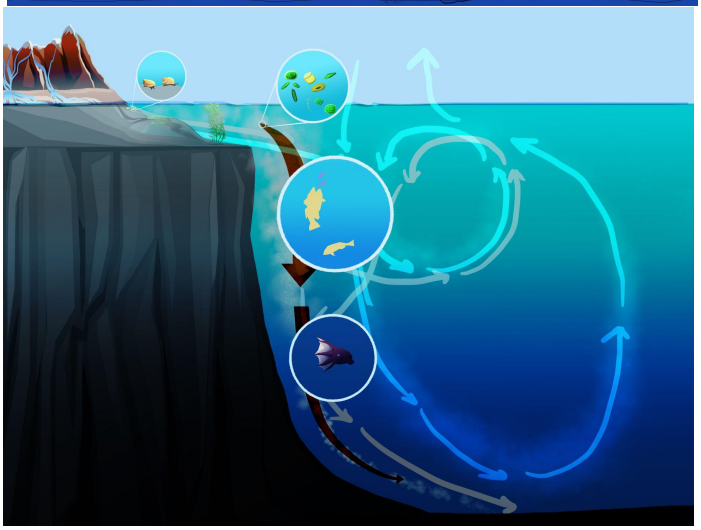
The second project for the summer was much more expansive and open ended. Unlike with the Weird and Wonderful video, this project didn't have a set format, and there was no accompanying article to base the text on. As such, a project brief including the separate sections, mediums, and deadlines had to be drafted. Within this project brief, it was determined that there would be two, possibly three sections: A top of the page infographic which would track organic and inorganic carbon's pathways through the ocean, and one or two articles that would detail how climate change is disrupting ocean systems. An infographic was decided upon for three main reasons. Firstly, the subject of ocean carbon can be hard to get a grasp on as it's hard to visualize: carbon dioxide is invisible to the naked eye in both atmospheric and dissolved form. It's difficult to understand how carbon can build up in one area and decrease in another if it's not immediately visible. Making an infographic that could add a visual component to a complicated process could make it easier to comprehend. The second reason for choosing an infographic was engagement, and grabbing people's attention. A user will spend an average of ten to twenty seconds on any given webpage, and 55% of users will spend fifteen seconds or less reading

text on a page (Eisenberg 2018). Given the purpose for this project was to educate people on the wonders of the ocean and detail the dangers of carbon emissions, less than twenty seconds of reading time was not going to be enough. In order to get people's attention, a visual component was needed, as that would not only keep them engaged, but convey information faster. People on average process visuals over 60,000 times faster than text, an incredible statistic that drives home the importance of an infographic (Eisenberg 2018). If a user were to only spend ten to twenty seconds on the landing page, they would at least be coming away with far more information from those brief seconds than if they had been presented with a block of text.

This infographic has undergone a plethora of revisions in order to arrive at its current stage. The process involved a three-pronged approach: meeting with scientists Crissy Huffard and Yui Takeshita to get necessary information about the different types and life stages of ocean carbon, meeting with mentors and editorial staff Susan von Thun and Madison Pobis to fine tune language and structure, and implementing design elements to make sure the infographic was eye-catching and understandable.





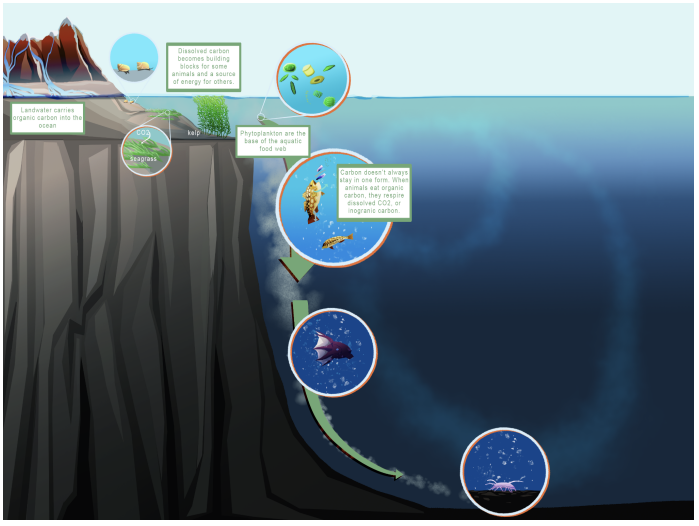


**Figure 5:** Drafts of the ocean carbon infographic. The initial design was scrapped after discussions of its scientific accuracy and functionality as a flat infographic rather than an animated one, and the new design was drawn up. After many color and placement changes, the infographic was closer to its final form.

After many rounds of feedback from both Susan and Madison and Crissy and Yui, the infographic began to more closely resemble its final form.

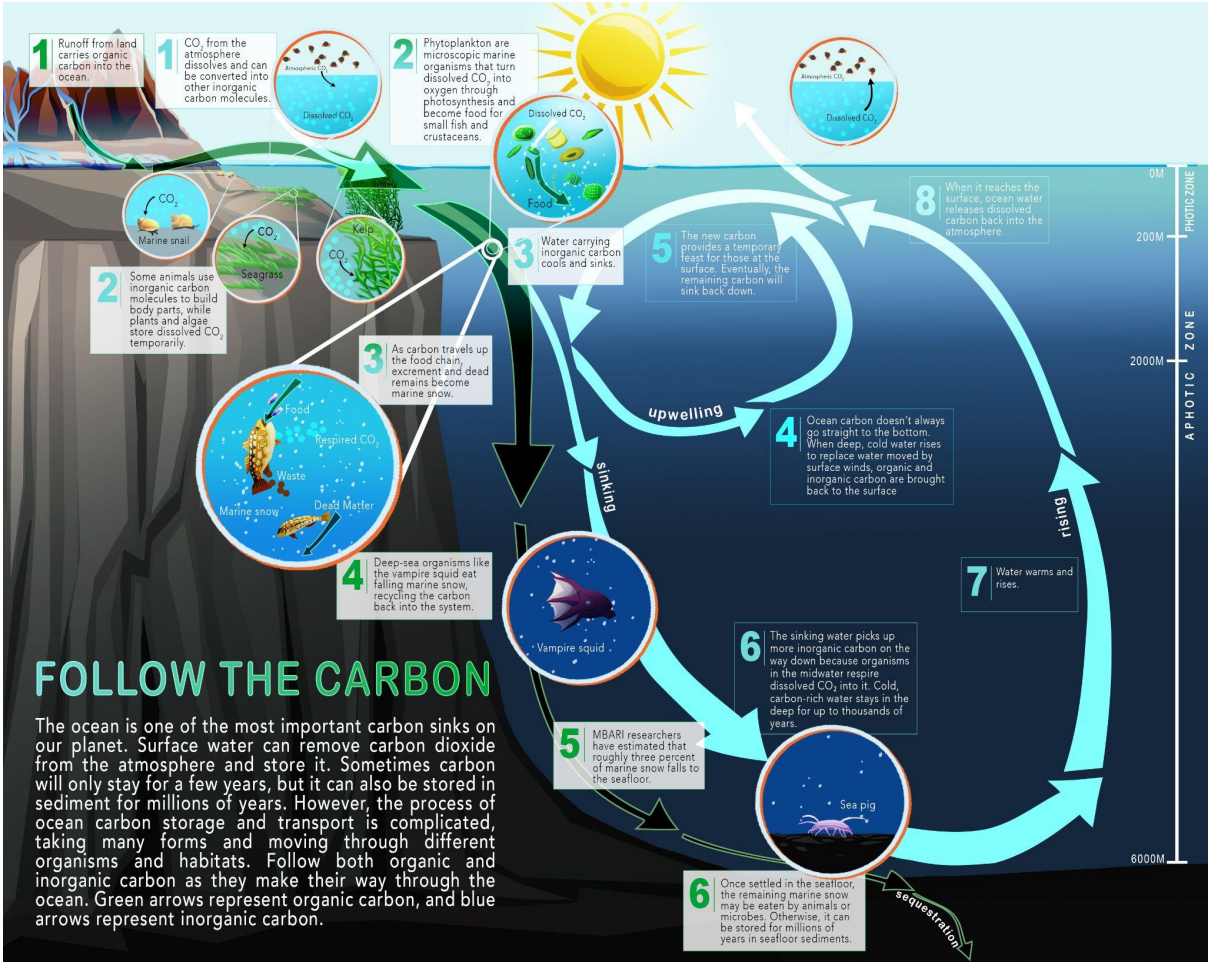



**Figure 5:** Current draft of the ocean carbon infographic. There is still room for improvement, but the infographic has come a long way from its original form and close to completion.

The current draft is still not entirely complete, but it has all of the essential elements and text. It also implemented the design needs of having a clear eyeline from top left to bottom right and textboxes that followed that arrow. It was a Herculean effort to complete both the visual and written elements, but the end product was worth the work. Future modifications would be to fix some areas that were messed with accidentally during the final cleaning (missing arrows, alignment of the waterline with the end of the infographic, missing detail in the bottom area) and moving around

some of the textboxes and zoom circles so that all inorganic boxes are on the right and all organic boxes are on the left.

To go with this infographic, an article about the dangers of climate change and human activity was also written, with an emphasis on ocean acidification and the deep sea. This article was meant for those who wanted to learn more than a few seconds or minutes on the infographic would teach them, and is planned to be situated below the infographic. This article is still in its early stages, but will hopefully be finalized and cleaned up at some point for the landing page.

## Results:

The landing page has not yet been published, as its components are not yet complete. However, the current draft of the infographic was met with a positive reception when presented at the intern symposium on August 11th. Multiple MBARIans from both the scientific and editorial sides reached out to compliment the infographic and pointed out its future usefulness in education and outreach. Hopefully these items can be further refined and published on MBARI's website in the future.

## Conclusion:

There are certainly a lot of challenges in communicating about the ocean, the deep sea in particular. People have developed their own fears and misconceptions about the deep, and perhaps aren't as knowledgeable about the ocean's complicated processes as those who do research in the field. However, through science communication MBARI has the opportunity to shift the way people think and talk about the deep sea. The Weird and Wonderful video was evidence enough that there are people out there who love the deep sea and feel a strong connection to it. With further outreach and education, more people may come to love it as well, and perhaps protective legislation can prevent it from being lost.

## References:

BBC. (2012, April 15). *Anglerfish on show at Blackpool aquarium*. BBC News. https://www.bbc.com/news/uk-england-lancashire-17720969.

Deggans, E. (2021, August 10). *NBC touts a silver lining in historically low viewership for The Tokyo Olympics*. NPR. https://www.npr.org/2021/08/09/1026282820/nbc-tokyo-olympics-low-viewership-ratings.

Eisenberg, H. (2018, October 8). *Humans process visual data better*. Thermopylae Sciences + Technology. https://www.t-sciences.com/news/humans-process-visual-data-better.

Funk, C., Hefferon, M., Kennedy, B., & Johnson, C. (2019). Trust and Mistrust in Americans' Views of Scientific Experts. *Pew Research Center.*

Hopkins, R. *(2014, May 13). Unbelievable: Why Americans Mistrust Science. Nature news. https://www.nature.com/scitable/blog/scibytes/unbelievable/.*

Jamieson, A., Singleman, G., Linley, T., Casey, S. (2021). Fear and loathing of the deep ocean: why don't people care about the deep sea?, *ICES Journal of Marine Science*, Volume 78, Issue 3, Pages 797–809, https://doi.org/10.1093/icesjms/fsaa234

Kahan, D., Peters, E., Dawson, E., & Slovic, P. (2017). Motivated numeracy and enlightened self-government. *Behavioural Public Policy, 1*(1), 54-86. doi:10.1017/bpp.2016.2

Lakoff, G., & Johnson, M. (2003). *Metaphors we live by*. Chicago: University of Chicago Press.

Rackley, S. (2010). Ocean Storage. In *Carbon capture and storage* (pp. 267–286). Butterworth-Heinemann. https://doi.org/10.1016/C2009-0-19306-6