A Case for Ocean Exploration

Statement of

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before the

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Chairwoman Fletcher, Ranking Member Lucas, members of the Environment Subcommittee, and members of the House Committee on Science, Space, and Technology, thank you for this opportunity to testify on this important issue.

I need to start with a disclaimer. I am not a formally trained scientist or engineer. My path to this hearing is unusual and worth explaining. It begins in an unexpected place — not a graduate school lab in Woods Hole or Monterey, nor on a research vessel exploring the high seas, and not on a Navy battleship. It starts in 2011 in my friend Eric Stackpole's garage in Cupertino, California. We were both in our mid-twenties and underemployed. We were attempting to build an underwater remotely operated vehicle (ROV) for as cheap as we possible could, using only off-the-shelf parts we could buy on the internet. Our goal was to use the robot to explore an underwater cave in the foothills of the Trinity Alps in Northern California, supposedly filled with gold from an abandoned heist during the gold rush. The story was an excuse for us to tinker with new technologies and, honestly, to have a little fun.

After our unsuccessful but commendable expedition to find the gold, the project took on a life of its own. The effort was reported on by the New York Times and we were overwhelmed with interest by others who wanted a similar, affordable device. We launched a project on Kickstarter to sell our design as a DIY, build-it-yourself kit and quickly sold more than we projected. Over the years, we grew out of the garage to become one of the largest volume ROV manufacturers in

the world, pioneering new designs, and most recently merging with another company to form Sofar Ocean Technologies. Our community, using our tools, have made important contributions to the understanding of species and ecosystems around the world, and contributed to the education and engagement of thousands of students and young explorers.

We only learned later, during a NOAA-organized meeting with leading ocean scientists and engineers, just how unique our effort had been. The scientists were less impressed with what we built (after all, they had those tools already), but in how we went about it: by openly sharing our designs online, crowdfunding our initial startup costs and, most importantly, engaging a global community of citizen scientists.

The experts were bound by constraints — both economic and institutional — that we were not. Our innovation was not a result of genius. It was mostly luck, born of necessity and amateur persistence. Our inexperience, mixed with a rapidly shifting technological landscape, created an opportunity to move the needle on small, low-cost ROVs.

I tell you this long story for context, but also because we learned important lessons which I submit this committee could find useful.

The first is to remember that the mission of ocean exploration — to illuminate the unknown — carries multiple meanings. It's widely reported, and I'm certain others here will reiterate, what little percentage of the ocean we've explored and characterized. Whether mapping the ocean floor, or studying the varying depths of the water column, there are still vast areas of earth left to explore. And we should. But there is another responsibility of the ocean exploration enterprise that doesn't get as much attention: *how* we explore. Part of the process of discovery is the constant search for a better way and a new perspective. This is the technological frontier and it's as dynamic and full of opportunity as the unexplored places. The emerging fields of robotics and machine learning, the advancements of eDNA and genetic sequencing, and the steady march of Moore's law and increasing connectivity continue to make this fertile ground for experimentation. We're still at the beginning of applying these technologies to the mission of understanding and monitoring our ocean. Over 10 years ago, NOAA made a leap by operationalizing Dr. Bob Ballard and the Ocean Exploration Trust's vision for telepresence and its potential to scale the effectiveness of a single ship at sea. Telepresence has completely changed the way we conduct science, engage the public and inspire the next generation. We need more leaps. Exploration is where we go *and* how we get there.

The second lesson is that entrepreneurs and startups are an increasingly important part of navigating this technological frontier. Congress would be wise to look at the evolution of NASA over the past decade and hope for a similar ocean renaissance. As a generation of space entrepreneurs took to the cosmos, NASA was able to find commercially competitive contractors to take over launch and other duties, which allowed them to focus their resources on what they do best: going further. As NOAA faces the challenge of managing aging ships and infrastructure, the agency would do well to focus enough of their limited resources on stimulating a vibrant private sector rather than trying to rebuild everything themselves. This will spur more innovation, good for both NOAA and the taxpayer.

The last lesson we learned is that ocean exploration is for everyone. We all have a stake. This is not just a coastal issue. We were surprised by the enthusiasm we received for our project all over the country and world. Citizen scientists are aching to get more involved, hoping for institutions like NOAA to lead them. The future should be built with an architecture for participation.

The issue of ocean exploration, while often distant and out-of-sight, plays an outsized role in the human imagination, and engaging everyone in this mission is critical for our survival. I can do no better than John Steinbeck's call to the sea, published in 1966 in Popular Science and as relevant as ever:

> We must explore our world and then we must farm it and harvest its plant life. We must study, control, herd, and improve the breeds of animals, because we are shortly going to need them. And we must mine the minerals, refine the chemicals to our use. Surely the rewards are beyond anything we can now conceive, and will be increasingly needed in an over-populated and depleting world.
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> There is something for everyone in the sea—incredible beauty for the artist, the excitement and danger of exploration for the brave and restless, an open door for the ingenuity and inventiveness of the clever, a new world for the bored, food for the hungry, and incalculable material wealth for the acquisitive—and all of these in addition to the pure clean wonder of increasing knowledge.

Ocean exploration is a cause worth championing. I humbly request that you do.

David Lang is an entrepreneur, writer, and a co-founder of Sofar Ocean Technologies. Prior to Sofar, he co-founded OpenROV to create a low-cost underwater drones as well as OpenExplorer, a digital field journal to empower and connect citizen scientists and explorers. His work has been featured in the New York Times, WIRED and National Geographic. His TED Talks have been viewed by millions online. Lang is the author of *Zero to Maker*—part memoir and part guidebook for participating in the growing maker movement. He is also a member of NOAA's Ocean Exploration Advisory Board and a TED Senior Fellow.