

great adventures underwater, that's what has really encouraged more and more people to now think about submersibles, when they're building their new yacht. Forget about just going down exploring for fun, but you could go down and fund a fantastically interesting science project. The submersibles are versatile. You can equip them with any tool you want to enable you to accomplish whatever your goals might have to be in deep water.

Sunami

— **Sea Balloon, your partner in Japan, is getting into the business of recreational submersibles, bringing the oceans to closer to us.**

Lahey

We need pioneers, people who are willing to try something new and exciting and encourage people to start looking at our oceans differently. When you look out over the ocean you see this dark surface. Your eyes can't penetrate it. When you stand on the beach and you look up at the stars, they are twinkling, and you can imagine all the wonderful things that are happening out in space. When you get into a sub, when you go underwater, and you turn the lights on. Now, all of the sudden, you are looking at the ocean in a way that allows you to connect with it. The ocean community needs to engage people who have never had the opportunity to see the ocean in this way. In a submersible with the lights on, from this perspective you get to see the most magnificent place on our planet.

Getting that content out here for others to see and to get excited about is the key. That's what people are doing with the submersible we have built or are building now for them. All this comes from people willing to fund exciting projects like Sea Balloon. It's a great concept and we are excited to be working with them, and I can't wait until we build the first one.

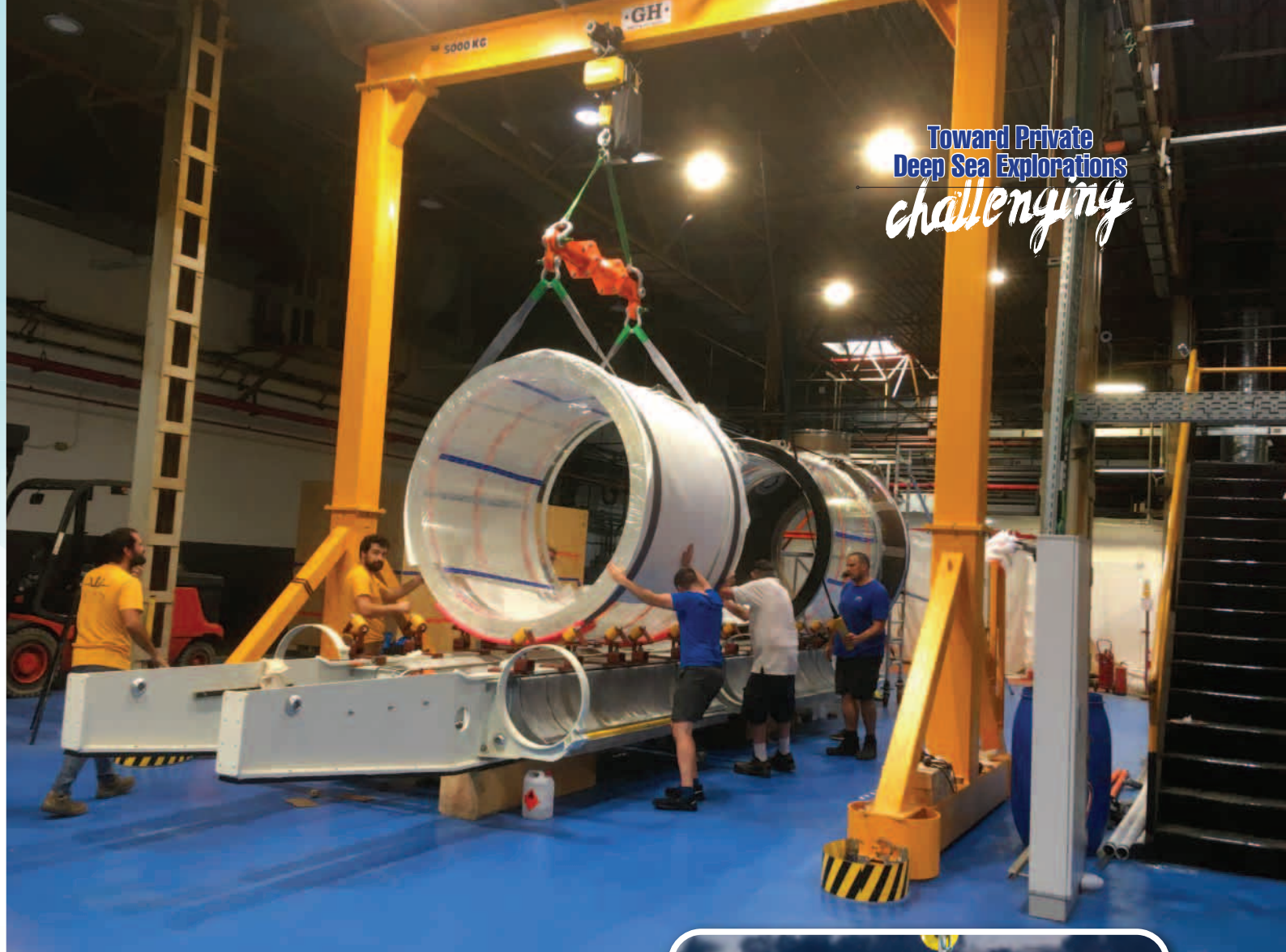
Sunami

— **I understand the importance of being physically there in a sub and observing with your own eyes and senses. At the same time, for a scientist, there is an issue of trade-off. Considering the cost of doing science, collecting data using ROV is important. From scientists' standpoint, what is so important about actually being there in a submersible?**

Lahey

I'll give you a great example. Imagine your wife is going to have a baby. Tell me what would be more powerful and more memorable: being there when the baby is delivered and physically seeing that happen in real time, or hiring somebody to go in there and film it and then you can watch a movie later? What do you think would have a greater impact? What do you think would stay with you longer? If you're a bird watcher and you're just going to look at videos from a drone, it's not the same thing as walking through that forest and turning and looking and seeing and drinking in all that information in.





We have a tremendous capacity to take in information through our eyes and with our senses. We are sensory beings. I think being there in real time is critically important to scientists. I have a good example. I did a dive a few years ago in the Solomon Islands with the American Museum of Natural History. Mr. Dalio and his program funded this expedition on behalf of the American Museum of National History. We did this vertical transect. We started at 1,000 meters and we came up in 100-meter increments, stopping each time, and we had all the lights out and we were setting off these powerful strobes to capture this vertical migration in the water column⁶. At about 600 or 700 meters when we set off the strobes and then we opened our eyes, the entire water column was lit up in every direction as far as you could see. We all were so blown away by what we saw from inside that transparent pressure hull. I said to the scientists who were in the submersible with me at the time; “This is why you need human-occupied vehicles. You could never capture this moment with an imaging system. I don't care how good the imaging systems might be. You're never going to be able to give somebody the same experience sitting in that seat seeing the scene with your own eyes.” It

⁶ A vertical mass of seawater



was so powerful that it took your breath away, just like Dr. Kubodera sitting in that sub and seeing that giant squid. He was looking at it and it was looking back at him with that big blue eye. You can't duplicate that. So, human-occupied subs are important because we need to bear witness. We have to experience in real time, and then we can tell the stories to others and encourage more people to take an interest in our oceans.

Takai

— You are very passionate.



Lahey

I just can't help it.

When I was working on oil platforms, I dived in a submersible to a blowout preventer on the sea floor. I went to about 500 meters and then came right back up and had lunch. I went far deeper than I had ever gone as a commercial diver. I stayed on the bottom there for several hours, and then I came right back up and came out. No ill effects, no decompression. The experience was so profound and powerful, I decided that moment, I was going to devote my life to these wonderful machines that can take people into the deepest part of our ocean because they are transformative, magical.

Takai

— **You have had already many experiences underwater as a diver, and you have been impressed by the underwater scene. You knew**

how exciting it was. Many people don't have that kind of experience. I think it is making it difficult to develop human-occupied submersibles. We, JAMSTEC, have many people, but just a limited number of them have underwater experience. I have a lot of wonderful underwater experiences, but it is very difficult to convey the excitement to people who have never been there.

If many more people could ride in submersibles and experience underwater, we could convey the excitement more broadly.

Lahey

Very good point. We just built a sub that we delivered to Vietnam. It's just getting commissioned and will start operations in 2021. It is a completely transparent acrylic cylinder that dives to 100 meters. It is not very deep diving, but deep enough. What is important is

Toward Private Deep Sea Explorations *challenging*



that it carries 24 people and three crew members. As you can take more people, and they can see the ocean and connect with it viscerally, that's how you're going to create advocacy. Also, when people see great documentaries and people inside, they get to see the ocean from the perspective a submersible. It's not the same as being there, but it's a great way to create interest and excitement in our oceans. Our oceans are in peril, and they need our attention. I think a great way to promote that idea is to create the kind of advocacy that's going to make people care about the oceans like caring about your family, your children.

Takai

— I think your idea is great. I think you need to develop a deep-sea submersible train. I want you take 100 people to the deep sea.

Lahey

Yes, we can do it. We have a design for a submersible that will carry 66 people. You never know where the inspiration might come from. It could be that kid like me, sitting in front of the TV watching Cousteau or watching the latest documentaries of NHK or National Geographic. We need to inspire a younger generation to not just be thinking about what's out in the stars and looking for our exit from this planet, but looking at what we can do to protect this beautiful planet that we are lucky enough to live on. And, of course, ocean conservation and sustainable practices are critical parts of that. What you are doing is the important work of ocean policy. I feel genuinely privileged to be part of a program where you are talking about ocean policy. I'm a submarine builder, but I believe that the tools that I build are important parts of creating the kind of advocacy that might influence policy. For example, the content OceanX creates and the stories that they tell are great ways to generate changes in ocean policy. It starts because you get a groundswell of support.

I love the idea of the Convention on Biological Diversity's 30x30 Goal. It is an effort set aside 30% of our world's oceans by the year 2030 so that areas that are in peril now can recover. I am from Canada originally. The Grand Banks of Canada was considered to be an inexhaustible supply of fish. Today, the Grand Banks fishery in Eastern Canada has collapsed because we didn't know how to implement, maintain or enforce sustainable practices. My hope is that we would set areas aside as marine protected areas and give the ocean an opportunity to heal. It is remarkable how the ocean can recover, but we have to create the opportunity for it to do that. I think a big part of future ocean policy is setting aside marine protected areas for recovery.

Sunami

— You are one of the few people who have been there and have seen the deep ocean. I wonder if you see recent changes of the environment in the deep ocean. We talk about plastics, depletion of fish resources, and different migration patterns. Things



are happening because of pollution and climate change. Have you noticed something happening out there in the deep sea?

Lahey

I've seen it. I've been to places and noticed big changes from the way they looked 30 years ago or 20 years ago, or even ten years ago. So, there's no question that changes are happening. Of course, changes are happening all the time, but I do think we're at a critical point as a species. We have the ability to change that trajectory, and I think it's incumbent upon all of us who love the ocean and care about this planet to do whatever we can to change that trajectory to encourage people to start living in harmony with our natural world.

Takai

— Your submersible is a very new concept, and many people are surprised at your concept. As a scientist, I think Triton has room to improve. When conducting scientific research in the deep ocean, advanced communication between the sub and the mothership and underwater mobility are required. If Triton subs could be utilized for heavy duty scientific research, your company would grow further. While recreational submersibles probably do not require such functions, for scientific research, a robot arm with human-like dexterity (manipulator systems) is required.

Lahey

I'm really excited about the idea of building our own

manipulator systems. Manipulator systems are critical to interface with the ocean. You can recover samples and interact with things. We've been advancing the design of the vehicles themselves, so they can carry more people, they can dive deeper, and they can stay longer. Now that they have greater capabilities, we do need to start looking at better interface systems.

We used a remarkable manipulator system on the Full Ocean Depth sub built by Kraft Telerobotics. They are very capable robotic arms, but we need to keep going further. I like the idea of touch: of a haptic interface you can use almost like a hand. You can pick up something delicate like a sponge or something big and heavy, and you can interact with the kind of dexterity that we have. It is a very difficult thing to achieve, but human beings have the tremendous capacity to innovate and to create. If we set our minds to something like building a better interface system, a more capable manipulator system, or better collection system or other heavy tools that allow scientists to accomplish more, we can do it. Right now, we're working on battery systems that are going to allow us to stay longer and to travel further and to cover more ground. It is very exciting that a lot of these technologies are coming out of the automotive world. We live in a remarkable time in history.

Takai

— White Paper on Ocean Policy, in which this interview appears, also covers United Nations Decade of Ocean Science. The 7th agenda, “an inspiring and engaging ocean” sets out to convey the ocean's appeal for society to understand and value the ocean. I think Triton's submersibles fit the bill perfectly. The White Paper is distributed not only to government agencies, but also to many high schools and universities in Japan. Some young people who read this interview might want to work as an engineer for your company. Do you have any Japanese engineers in Triton?

Lahey

We don't have any Japanese engineers, but many young

engineers work at Triton. You are right in promoting these ideas to young minds and encouraging them to consider oceanic careers, whether it's a scientific or engineering, exploration, filming, or whatever it is. I think JAMSTEC is so vibrant and a well-funded program because as a nation, Japan takes the ocean and ocean science very seriously. Maybe it's because of your dependency on the ocean as an island nation. I was blown away by the great equipment I saw. You have to keep doing that, and you have to keep encouraging the next generation of people.

Sunami

— Lastly, I would like to leave some words for Japanese audiences. You've already touched upon some of the important messages for the students and the young people in Japan. Do you have a message for those that are really thinking about following your path of startups?

Lahey

There is a piece of advice that my father gave me, and

I think it's powerful. Everybody in their life should find that thing they love. In my case, it was the ocean. It still is. Find the thing you love, work hard at it, and success is the inevitable result. Do that thing you love; do that thing you are passionate about. From the time I was seven years old, I was in love with the ocean. When I first set eyes on it, when I lived on the island of Barbados, the Caribbean, I just knew that whatever I did in my life it had to involve the ocean. I didn't know I'd end up building submarines, but I just knew that the continuous thread through my life has always been the ocean. So, my advice to anybody, young people in particular, is follow your bliss, do that thing you love, do that thing you're passionate about and don't give up on it. Work hard at it, and you'll eventually reach your goal. I believe that very much.

Sunami

— Thank you very much. it's been wonderful talking with you today.

