

House testimony by Dr. Robert D. Ballard

I want to thank you for inviting me to testify before your Subcommittee as I am honored to be included with the other three witnesses being asked to speak today.

As you have just heard, all three of them provided you with expert recommendations on the specific questions we are being asked to answer.

I would, however, like to approach your questions from what may prove to be a different perspective than theirs since being dyslexic I, like the other 20% of our population that are dyslexic, see the world through a different lens as you will soon see.

When it comes to major gaps in our understanding of the ocean, coastal, and Great Lakes science and technology, I was taught to spend 90% of your time on 90% of the problem.

As an oceanographer and undersea explorer I know that most Americans are unaware that 50% of America's land mass lies beneath the sea, yet we have better maps of Mars and the far side of our Moon that half of our country, which is contained within our Exclusive Economic Zone or EEZ, and it would cost less to map the world's oceans than it cost to map Mars.



Every classroom in America should have a map on its wall that shows our great land mass since the largest mountain ranges on earth lie beneath the sea; there are thousands of active volcanoes containing untapped geothermal energy; there are deep canyons that make the Grand Canyon look like a shallow ditch.

Fortunately, Congress created the Office of Ocean Exploration within NOAA in 2004 but only recently has it begun to give that Office the resources needed to map and characterize that 50% of our country over the next 10 years. Clearly, Congress needs to ensure that the program is fully funded, which is not the case; if not, accelerate its funding in FY-2022 and beyond since we need to know what we own.

When it comes to the “Oceanshot” proposals that have been submitted to you for advancing ocean, coastal, and Great Lakes Science and Technology, I found a glaring absence of use of the innovative tele-presence technologies combined with the use of autonomous vehicle systems including un-crewed surface ships.

The Department of Defense and private industry are much further down this road than the oceanographic community with DARPA’s un-crewed SEA HUNTER and Ocean Infinity’s ARMADA autonomous surface ships as well as un-crewed containerized ships that will soon be coming on-line. Clearly, the oceanographic community needs to be thinking of when the first unmanned oceanographic ship will be coming on-line and they are not.



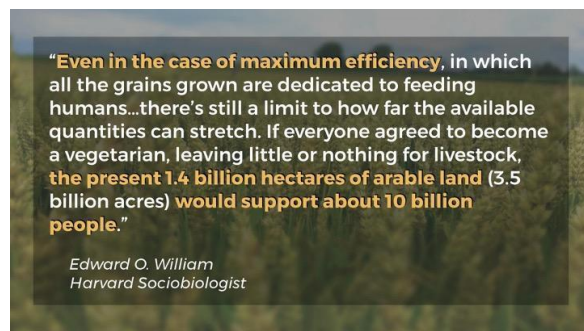
Last year, during the height of the Covid-19 Pandemic, our ship of exploration, the E/V NAUTILUS put to sea when most other research ships did not.



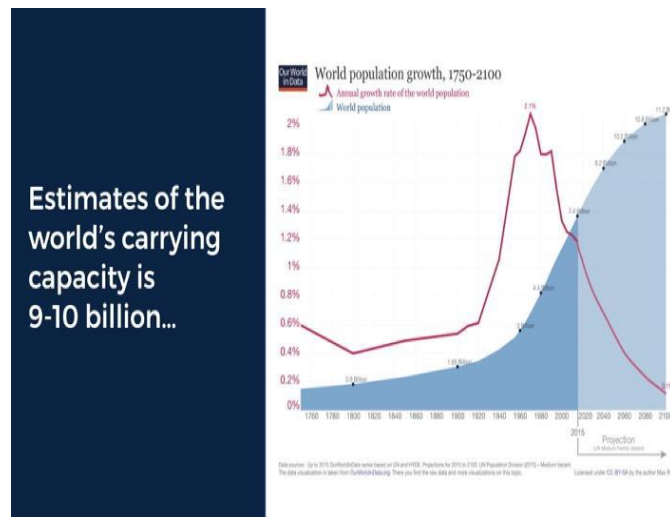
Thankfully, we had already implemented the use of tele-presence technology, which does not require the science team to be at sea, clearly a major step in the direction of un-crewed research ships and this year we begin moving the operating team ashore as well.

When it comes to the Blue Economy, I believe the most important action we need to take is feeding the growing population of the world, since there is a major crisis facing the world in less than one generation.

Noted Harvard Socio-biologist E.O. Wilson shows that there is a limit to how many people the world's farmland can feed even if all humans are vegetarians and that limit is 10.5 billion.



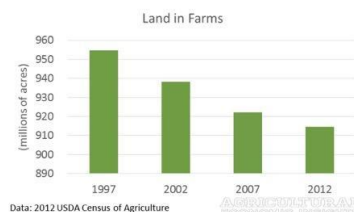
Based upon the latest projections of the world's population, we will reach that number by 2050 if not sooner.



This crisis could come even sooner than 2050, since we are using up our farmland to house our growing population and just last week China encouraged its people to increase the number of children in their families by 50%, which this curve does not take into consideration.

The problem is, we are using up all of our farmland to house our growing population since 95% of the human race lives on 5 to 7% of the Earth's surface.

Farmland acreage continues to decline...



From 1997-2012, the average farmland loss was equivalent to:

5M acres per year
4K acres per day
172 acres per hour
8 acres per minute



Fortunately, 95% of the living space on Earth is in international waters



So, we need to turn to the sea to feed our growing population as farmland goes down.



But there is another problem and that is we have tracked down and killed 90% of the large wild fish in the sea, which has totally disrupted the ocean's ecosystems.

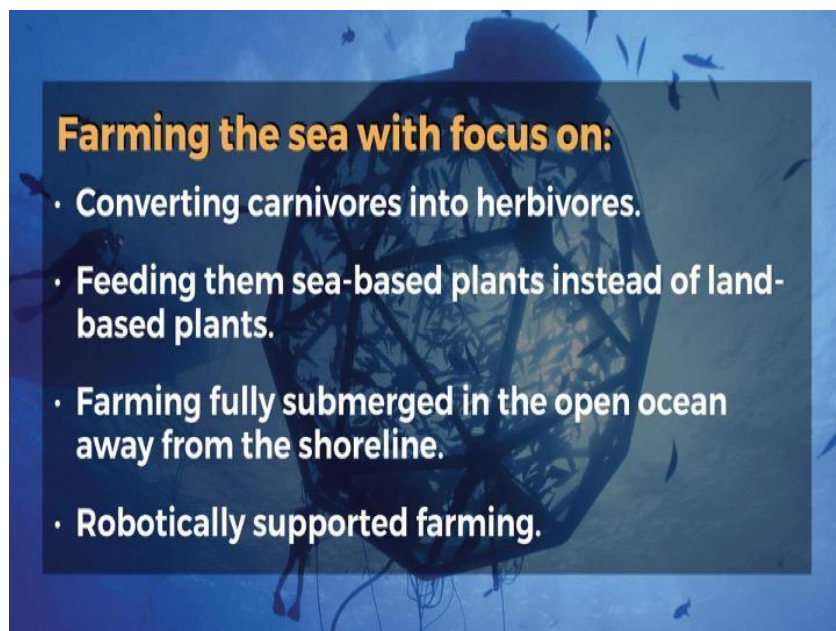


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We need to move away from a hunter/gather society at sea and, like on land, become a farming and herding society. **Our focus should not be on sustaining the life in the sea but greatly increasing its productivity.**

We need to do open ocean aquaculture in the tropics where there are few fish living in mid-water by converting carnivores into herbivores. Feeding them sea-based plants instead of land-based plants. The farming cages would be fully submerged far from land in deep water and managed by undersea autonomous vehicles.



Farming the sea with focus on:

- Converting carnivores into herbivores.
- Feeding them sea-based plants instead of land-based plants.
- Farming fully submerged in the open ocean away from the shoreline.
- Robotically supported farming.

When it comes to the increased engagement of underrepresented minorities in ocean science and technology and how we involve them, once again I look at this issue through a different lens.

To begin with, I view the 15 to 20% of our population with dyslexia as an underrepresented minority.

35% of entrepreneurs are dyslexic, 40% are self-made millionaires, as are 50% of NASA's rocket scientists. Dyslexia is called the MIT disease given the unusually high percentage of their students that are dyslexic.

The rich and famous ranks are filled with dyslexics including our founding father, President George Washington, Albert Einstein, Leonardo DaVinci, Ted Turner, Whopie Goldberg, Richard Branson, Charles Schwab, and on the list goes.

That's the good news but there is always the other side of that coin. Dyslexic children are told they are stupid and are made to feel a level of shame equal to the shame associated with incest.

35% of them dropout of high school. 50% of those in drug treatment and rehab are dyslexic, which also make up 60% of our youth in juvenile detention centers.

It costs far more to send someone to prison than to send them to Harvard and in the former case it is not for four years but commonly for many more years. When we tax those dyslexic millionaires and billionaires, a portion of their taxes should go towards ensuring their fellow dyslexics are detected as early as possible in their young lives and put on known paths to success in engineering, health care, architecture, the arts, and on the list goes including marine geology like me. Being dyslexic makes it possible for me to explore in total darkness – it is a piece of cake!

We need unifying actions by Congress and here is one that can lead to such action. Just look at your Congressional colleagues that make up the membership of the House Dyslexia Caucus

Moments ago, I spoke about the rise of autonomous ships and underwater vehicle systems in ocean science using tele-presence; something I helped pioneer since 1981. Fundamentally, it is an advanced video game as is the use of drones in modern warfare, which dyslexics excel at.

I would encourage the development of video games related to undersea exploration and research to tap into this human resource, which is being wasted since electronic travel is just around the corner and dyslexics will be dreaming up the technologies needed to do it.

The recent Covid-19 pandemic introduced electronic travel to the world and once high bandwidth connectivity reaches our homes, business travel will collapse, replaced with more time with the family while at the same time greatly reducing our carbon footprint.

It will also make it possible for the average family to rent a robot from Hertz, Avis, or a new company yet to emerge to visit the game preserves in Africa over the weekend.

There are other creative ways to engage underrepresented minorities in ocean science and technology but we need to start very early in their lives.

Aquariums engage toddlers in the wonderment of the underwater world.

We begin in middle school to engage all American children in live interactive exploration in all possible venues.



Equally important, I have insisted that my Corps of Exploration, which is now exploring the New America beneath the sea, has all the faces of Americans in its ranks to serve as role models and mentors for the next generation.





When it comes to the increased engagement of other underrepresented minorities in ocean science and technology, studies show 64 percent of African Americans have no or low swimming ability, but I add, that 65 percent of these kids would like to learn if they could.



We need to overcome people's fear of the ocean.

In short, I would make sure every Boys and Girls Club, or similar venue has a swimming pool to teach kids how to swim followed by SCUBA diving classes. When not swimming or SCUBA, they have remotely operated underwater driving competitions augmented by video games using remotely operated vehicles (ROVs). And they learn how to build ROVs.



When it comes to involving more Native Americans and Hispanics in ocean science and technology I would focus on their early history in America. We know that Native Americans and many members of Hispanic communities in America can trace their origins to the migration of humans across a land bridge called Beringia that formed during the Last Glacial Maximum some 22,000 years ago when vast glaciers covered the world's landmass, lowering sea level some 125 meters or 410 feet which was later reclaimed by the sea as the ice sheets melted and flowed back into the sea.



As a result, there are vast areas of the U.S. continental shelf that were once occupied by the ancestors of today's Native Americans and many Hispanics living in America including underwater caves we have only recently discovered.

Clearly, there should be more efforts made to explore this ancient landscape with Native American and Hispanic scientists and engineers leading the way.

A significant portion of America's EEZ also lies in American Polynesia that needs to receive more attention including recognition of their incredible skills at maritime navigation. Hawaii, for example, is the most isolated place on Earth, yet it was discovered by Hawaiians more than 1,500 years ago.

Finally, much of what I am recommending cuts across many disciplines, which are supported by different agencies within the Federal Government including the Departments of Commerce, Interior, Education, Defense, to name a few. For that reason, there needs to be greater emphasis upon inter-agency programs focusing through organizations like the National Ocean Partnership Program.

Robert D. Ballard, Ph.D. – is Founder and President of the Ocean Exploration Trust; Professor of Oceanography at the University of Rhode Island Graduate School of Oceanography. He is an Explorer-At-Large at the National Geographic Society, Commissioner for the U.S. Commission on Ocean Policy, and a Research Scholar at the Woods Hole Oceanographic Institution. He served in the U.S. Navy for more than 30 years and continues to work with the Office of Naval Research. A pioneer in the development of deep-sea submersibles and remotely operated vehicle systems, he has taken part in more than 155 deep-sea expeditions. In 1985, he discovered the RMS *Titanic*, and has succeeded in tracking down numerous other significant shipwrecks, including the German battleship *Bismarck*, the lost fleet of Guadalcanal, the U.S. aircraft carrier *Yorktown*, and John F. Kennedy's boat, *PT-109*. He has also discovered hydrothermal vents and "black smokers" in the Galapagos Rift and East Pacific Rise in 1977 and 1979. The author of numerous books, scientific papers, and articles, he has been featured in several *National Geographic* television programs, including "Secrets of the *Titanic*" a five-part mini-series, "Alien Deep with Bob Ballard." and, in 2019, "Expedition Amelia." He was a special advisor to Steve Spielberg on the futuristic television show *seaQuest DSV*. His honors include 22 Honorary Doctorates, *National Geographic*'s highest award, the Hubbard Medal, and a National Endowment for the Humanities Medal. He was elected a Fellow of the American Academy of Arts and Sciences in 2014. Dr. Ballard's autobiography, INTO THE DEEP, will be released Father's Day 2021 and National Geographic television special, "Bob Ballard: An Explorer's Life" will air June 14.