Moment for Nature
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I am deeply honored and feel enormously privileged to be here today addressing the General Assembly, and I want to thank President Abdulla Shahid and his senior advisor Mohammed Shaker for inviting me, and Achim Steiner and the UNDP, and Ligia Noronha and UNEP, for making this happen.

I want to introduce my collaborators on this project: Dr. Gael McGill and Jeannie Park.

I wish to make the case today that we must find powerful, new arguments to help people recognize that they must change their behavior if humanity is to survive in the long term. People strongly resist making changes, no matter how much they want to, no matter how much they understand the benefits.

So the challenge for all of us who spend our lives working to protect the natural world is to help convince people, in language they can relate to and understand, in terms that don't make them feel hopeless, that we have no other choice but to preserve this world of ours, this precious gift we have all been given, and that it is a delusion to believe we have a choice about whether we do so or not.

That is why I have spent the past 30 years, since the Rio Summit, working to explain, as a medical doctor, all the many ways that our health and our lives ultimately and totally depend on the health of the living world. That is why, with UNEP, the UNDP, and the CBD, and my fellow Harvard Professor Ari Bernstein, I wrote and edited the award-winning Oxford University Press book, Sustaining Life: How Human Health Depends on Biodiversity, now available in Spanish, Japanese, Chinese, and Arabic editions.

And that is why my collaborators and I are here this afternoon.

We have prepared two booklets for you, designed to provide powerful, new tools to help people grasp this fundamental reality--that we have no choice. They are on your desks. The 1st, *How Our Health Depends on Biodiversity,* is an updated version of the booklet we prepared for the U.N.. for its International Year of Biodiversity in 2010. We revised and reprinted it, especially now that it is essential to discuss Covid-19. More on that later.

We are very excited this afternoon to be releasing our 2nd booklet to the General Assembly--*How Sustainable Engineering Solutions Depend on Biodiversity.* You are here at its world premiere.

What we are presenting with this project is an argument that the existential engineering challenges we face in order to live sustainably—challenges like how to produce and store energy without using fossil fuels; how to heat, cool, and ventilate our buildings with the greatest energy efficiency; how to move through the air and water with the least amount of fuel; how to make the strongest,

lightest, most biodegradable and recyclable materials —the answers to these challenges and essentially all the others we must meet, have been solved by the plants, animals, and microbes all around us.

With countless tests over many thousands and millions of years, evolution has selected, at each stage, engineering designs that were more perfectly adapted to the tasks they performed than competing designs, that were more energy efficient and resource conserving. The designs that didn't pass these tests, and the organisms in which they were found are no longer around. Only the successes remain. By this process of elimination, Nature has, in effect, done our engineering "field trials" for us.

Some of these designs are in specific groups of organisms. Some are found only in a single species. So that when those organisms go extinct, they take these designs with them, models that we may never know about, models that we can't afford to lose as we are running out of time to solve many of these challenges on our own.

I will mention 3 examples. We have spent considerable time finding the best ways to explain how these models actually work, as we believe this understanding provides a deeper sense of wonder and awe at the indescribable beauty and complexity of life on Earth, and a greater sense of urgency for protecting it.

Please turn to the section on Dragonflies on page 6.
Dragonflies may be the first flying organisms, with fossils dating their origins back more than 300 million years, 1000 times older than our species, *Homo sapiens*. They may also be the best. They can fly at 40mph; take off vertically; hover; and fly backwards, sideways, and upside down. They can also make instantaneous 180 degree turns with three wing beats.

Dragonfly flight is among the most efficient of any flying organism at low wind speeds, and it was understanding this that led Aeronautical Engineering Professor Akira Obata from Japan to develop micro-wind turbines, based on dragonfly wing design, that turned and generated electricity at wind speeds of 2mph. Most wind turbines perform poorly below 6mph; some will not turn at all. As a result, expensive towers need to be built to take advantage of the higher wind speeds found at higher elevations. But these dragonfly-inspired micro-wind turbines can be mounted on rooftops in off-the-grid locations, to provide lighting and to recharge cell phones and computers.

Some 15% of dragonflies and their close cousins damselflies are at risk of extinction, perhaps taking with them blueprints for the most energy-efficient micro-wind turbines.

Now turn to the section on Gliding and Soaring Birds on page 14.

Birds have taught us their secret of flying, and they continue to teach us how to fly with the greatest stability, maneuverability, and energy efficiency.

It is difficult for anyone who flies commercially not to have noticed that almost every plane now has wings that bend upwards at their tips. That wasn't the case 10-20 years ago. These upturned wingtips are called "winglets." How did they come about?

In 1973, during the oil embargo when the price of jet fuel had skyrocketed, an engineer named Richard Whitcomb, working for NASA, the U.S. National Aeronautics and Space Administration, observed that birds like hawks, eagles, and vultures had upturned wingtips when they were gliding or soaring. He reasoned that this must improve their energy efficiency. And so he began to design plane wings modelled after these birds. Whitcomb's "winglets" have revolutionized modern aviation. A study in 2018 found that the "winglets" present on only a fraction of commercial and business jet planes worldwide saved more than 10 billion gallons of fuel, the equivalent of taking more than 20 million U.S. cars off the road for one year, and reduced CO2 emissions by 105 million tons, a reduction that would require the planting of 40 million acres of trees.

One last example, in Humpback Whales. Please turn to page 21.

Humpback whales reach lengths of 50 feet and can weigh more than 30 tons. But despite their massive size, they can make fast, tight turns in the water, and even breach, that is thrust themselves completely out of the water. They are perhaps the greatest acrobats in the oceans, for their size and weight.

What is their secret for this extraordinary mobility?

Humpback Whale flippers are 16 feet long, the largest of any whale. In fact, they are the largest appendages of any living animal. The flippers have protruding bumps called tubercles (as they resemble the bumps sometimes found in tuberculosis) that are spaced regularly along the front edges of the flippers. But it was not until research by Professor Frank Fish at West Chester University in Pennsylvania, and his colleagues, that it was understood that the tubercles allowed Humpbacks to achieve enormous lift forces in the water without creating strong water resistance. Understanding and applying this design led to the production of commercial wind turbine blades and fans that may be among the most energy efficient of them all.

Humpbacks almost went extinct. If they had, this unique design, found in no other organism, would never have been discovered.

So that is our message—with the biodiversity crisis continuing unabated, we are in danger, not only of disrupting ecosystem services that support all life on Earth, but of losing Nature's sustainable engineering solutions.

Finally, I want you to look at the booklet *How Our Health Depends on Biodiversity*, really a mini-text book on this subject.

I will focus on biodiversity and human infectious diseases, specifically on HIV-AIDS and Covid-19.

There is overwhelming evidence that the virus causing HIV-AIDS was initially transmitted to people in West-Central Africa by exposure to the body fluids of infected chimpanzees, most likely during butchering of their meat. Since 1981, HIV-AIDS has infected more than 79 million people world-wide and killed more than 35 million.

HIV-AIDS is what is called a zoonotic disease, that is one that has "spilled over" from wildlife to humans.

What do we understand about Covid-19, which to date has infected more than 539 million people and killed more than 6.3 million.

While one cannot definitively rule out whether the original source of infection came from a coronavirus that escaped from a lab, there is a substantial body of evidence that Covid-19 was also, in fact, a spillover from wildlife, a zoonosis.

Zoonoses are driven, not only by this vast wildlife trade for food and exotic pets, but also by our exponential increase in tropical deforestation, by climate change, and by agricultural intensification, especially by our introducing domestic animals deep into the forest. All of these push wild animals out of their normal habitats into greater contact with people, and push people into previously inaccessible areas where wildlife live.

A new study has concluded that there are some 10,000 viral species in wildlife capable of infecting people, but that most of them are still circulating, silently, only in wildlife, not yet in people.

Will we learn anything from all the suffering, from the millions of lives lost from HIV-AIDS, and from those lost from Covid-19, which, I am very sad to say, played a role in the death of my brother-in-law and my sister, from the trillions and trillions of dollars spent and lost? Do we really need any more reasons to stop our cutting down and burning of tropical forests besides the fact that this practice will increase our risk for another zoonotic disease pandemic, perhaps one even more deadly than those caused by the HIV and Covid-19 viruses.

I don't want to end on that note.

What I want to say in closing is that I hope our work on biodiversity will provide you with compelling new arguments that will help us turn around the self-destructive paths we are on.

We have posted pdf copies of both of our booklets on the website address: www.naturestoolkit.com found at the bottom of the back cover of the engineering booklet.

With the booklets online, you will be able to watch the wonderful videos we have linked to, and to send booklets to your colleagues around the world.

Throughout my life, I have been convinced that if people fully and deeply understood what was at stake for their health and lives, and for the health and lives of their children, they would do everything in their power to preserve the living world. I still am.

Thank you for your attention.