As a little boy, and through my teen-age years, I became increasingly fascinated by the diversity of life. I had the great good fortune of being able to explore the outdoors year-round in beautiful habitats in Florida and my native state of Alabama. I had a butterfly period, a snake period, a bird period, a fish, a cave period, and finally and decisively an ant period. By my college years I was a devoted myrmecologist, a specialist on the biology of ants, but my attention and research continued to range across the great variety of life on Earth, including all that it means to us as a species, how little we understand it, and danger to it caused by human activity. Out of that broader study has emerged a concern and ambition crystallized in the Wish I make to you today.

My choice is the culmination of a lifetime commitment that began as a boy growing upon the Gulf coast of Alabama and the Florida Panhandle. As far back as I can remember I was enchanted by the natural beauty of that region and the almost tropical diversity of its plants and animals. One day, when I was only seven years old and fishing, I pulled pinfish up too hard and fast, and blinded myself in one eye. Later I discovered I was also hard of hearing in the upper registers. So, in planning to be a professional naturalist—I never considered anything else any time in my life—I found that I was lousy at bird watching and couldn't track frog calls either. So I turned to the teeming small creatures all around me, to the insects and other animals that can be held between the thumb and forefinger, composing the foundation of our ecosystems, the little things, as I cam to call them in later years, that run the world.

In so doing I entered a frontier of biology so strange, so rich that it seemed, and it continues to seem, as applying to a different planet.

We live on a mostly unexplored planet. The great majority of organisms on Earth remain unknown to science. In the last 30 years, thanks to explorations in remote parts of the world and to advances in technology, biologists have for example added a full one third of frog and other amphibian species to bring the current total to 5400, and more continue to pour in. Two previously unknown kinds of whales have been discovered, along with two new antelopes, dozens of monkeys, and a new kind of elephant and even a distinct kind of gorilla. At the extreme opposite end of the size scale, one class of marine bacteria, the prochlorococci, although discovered only in 1988, are now recognized as likely the most abundant organisms on Earth, and moreover responsible for a large part of the photosynthesis that occurs in the ocean. These bacteria were not uncovered sooner because they are also among the smallest of organisms, so minute they can't be seen with ordinary optical microscopy. Yet life in the sea may depend on them.

These examples are just a first glimpse of our ignorance of life on Earth. Consider the fungi, including mushrooms, rusts, molds, and many disease-causing parasites: 60,000 species are known, but more than 1.5 million have been estimated to exist. Consider the nematode roundworms, the most abundant of all animals. Four out of five animals on Earth are nematode worms. If all solid matter on Earth were to be eliminated except the nematodes, you could still see the ghostly outline of most of it in nematode worms. About 16,000 nematode species have been discovered; there could easily be hundreds of thousands, even millions still unknown.

This vast domain of hidden biodiversity is increased still further by the bacteria, which can be properly called the dark matter of the biosphere. In 2002, the last year for which I have information, 5700 species of bacteria had been recognized by biologists worldwide, but that the same number of species, roughly 5000 to 6000, are represented by the 10 billion bacteria that exist in a single gram of garden soil, the amount you can hold in the palm of your hand. Almost all those species would be unknown to science. A recent estimate holds that the number of species in one ton of soil is 4 million. What are they all *doing?* We don't know. Yet our lives almost certainly depend on them. There are, to take an example close to home, over 500 kinds of friendly bacteria living symbiotically in your mouth and throat, probably necessary to your health.

And there is still more. The viruses, those quasiorganisms, among which the prophages, or "gene weavers," promote the continued evolution and lives of the bacteria, are a virtually unexplored universe unto themselves. What constitutes a viral species is still unresolved, but this much we can say: the variety of genes found in Earth's viruses is enormous, and may exceed that in all the rest of life combined.

Nowadays, in addressing microbial biodiversity, scientists are like explorers launched upon the Pacific Ocean in a rowboat. But that is changing rapidly with the aid of new genomic technology. Already it is possible to sequence the entire genetic code of a bacterium in under four hours.

What will we find as we map the living Earth? And as we move past the relatively gigantic mammals, birds, frogs, and plants, to the more elusive insects and other small invertebrates and beyond, to the countless trillions of organisms in the invisible living world that envelope humanity? Already, what were thought to be all bacteria have been proved to compose instead two great domains of microorganisms, the true bacteria, and one-celled organisms called Archaea, which are closer than are bacteria to the ancestry of plants and animals over a billion years ago. Some serious biologists, and I count myself one of them, have begun to wonder whether among the more than 99.99 (and then take it on at several more decimal places) species of microorganisms, one might—just might—find aliens among them—true aliens, stocks that arrived from outer space, especially during the earliest period of biological evolution on this planet. We do know that some bacterial species can resist astonishing extremes of temperature for long periods of time. To the microbiologists I say: let's find out.

There may be a temptation to treat the biosphere just holistically, and the species that compose it as a great flux of entities hardly worth distinguishing one from the other. But each of those species—even the tiniest of the aforementioned prochlorococci—are masterpieces of evolution. Each has persisted for thousands to millions of years. Each is exquisitely adapted to the environment in which it lives, interlocked with other species to form the ecosystems upon which our own lives depend.

We will destroy these ecosystems and the species composing them at the peril of our own existence. And unfortunately, we *are* destroying them.

My own epiphany came in 1953, as a Harvard graduate student, while searching for rare ants found in the mountain forests of Cuba that shine in the sunlight either metallic green or metallic gold. I found my magical ants, but only after a tough climb into the mountains where the last of the native forests hung on, and were and are still retreating. I realized then that these species and a large part of the other unique animals and plants of Cuba, which took millions of years to evolve, are in the process of disappearing forever, and so it is in most other parts of the world.

The human juggernaut is permanently eroding Earth's ancient biosphere by a combination of forces that can be summarized in the acronym HIPPO. H is for habitat destruction, including climate change forced by greenhouse gas. I is for invasive species, the fire ants and zebra mussels, and brome-grasses, and pathogenic bacteria and viruses, that are flooding every country and at an exponential rate. The first P of HIPPO is for pollution. The second P is for overpopulation. And the final letter O is for overharvesting—driving species into extinction by excessive hunting and fishing.

The HIPPO juggernaut we have created, if unabated, is destined, according to the best estimates of biodiversity research, to reduce half of Earth's still surviving animal and plant species to extinction or critical endangerment by the end of the century.

Human-forced climate change alone, again if unabated, could eliminate a quarter of surviving species during the next five decades. What will we and all future generations lose if much of the living environment, the Creation if you prefer, huge potential stores of scientific information, of much of our environmental stability, and new kinds of pharmaceuticals and new products are thrown away? The loss will inflict a heavy price in wealth, security, and spirit.

Sadly, our knowledge of biodiversity is so incomplete that we are at risk of losing a great deal of it before it is even discovered. For example, about 200,000 species of all kinds of organisms are currently known from the United States, and the number could easily exceed 500,000 even without including microorganisms. Only about 15 percent of the known species have been studied well enough to evaluate their status. Of the 15 percent evaluated, 20 percent are classified as imperiled to some degree.

We are in short flying blind into our environmental future. We urgently need to change this, We need to have the biosphere properly explored so that we can understand and competently manage it. This should be a Big Science project, equivalent toe the Human Genome project. It should be thought of as a biological moonshot with a timetable. So this brings me to my wish for TEDsters and to anyone else around the world who hears this talk. I wish that we will work together to help create the key tool that we need to inspire preservation of Earth's biodiversity: the Encyclopedia of Life. The Encyclopedia of Life. What is it? It is an encyclopedia that lives on the Internet and is contributed to by thousands of scientists around the world. It has an indefinitely expandable page for each species. It makes the key information about life on earth accessible to all on demand. I have written about this idea before, and I know there are people in this room who have expended significant effort on it in the past. But what excites me, is that since I first put forward this idea, science has advanced, technology has moved forward. Today, the practicalities of making this encyclopedia real are within reach as never before. Indeed, in the past year a group of influential scientific institutions have begun mobilizing to realize this dream. I wish for you to help them. Working together you can make this real. The encyclopedia will quickly pay for itself in practical applications. It will transform the science of biology in ways of obvious benefit to humanity. And, most of all, it can inspire a new generation of biologists to continue the quest that started for me 60 years ago. To search for life, to understand it and to preserve it.

Thank you.