"Smithsonian Forever"
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(text as prepared for delivery)

Thank you for that kind introduction. I am delighted to be here, and it is an honor to join the long list of distinguished speakers who have been featured at Long Now Foundation Seminars.

I am also glad to be back in San Francisco again. My personal connection to the Bay Area began when I earned my Ph.D. at University of California at Berkeley. A bit later, I was on the faculty at Stanford for about a decade. More recently I have been a consultant for the ongoing seismic retrofitting of the Bay Area Rapid Transit system (BART). Most recently, I was here earlier this year for a brain-storming session about the future directions of the Smithsonian Institution.

This is a special time at the Smithsonian—a time when we are engaged in renewal and rethinking our role in the life of this nation and the world. We are entering a new era in which we intend to become more broadly engaged in helping our society gain a better understanding of how the world and even the universe works, and contribute to the solutions for some of the significant global challenges we face.

As part of that renewal process, we came here to San Francisco for a brain-storming session with a group of "new millennials," as the population demographers have dubbed today's young people. I asked them how we could reach out to their generation given the way they communicate. It was a lively discussion and at one point a young woman looked me in the eye and said, "Surprise me."

It would be easy to dismiss her comment as a reflection of a generation that has embraced the fast pace of change in today's high-tech world and is always looking for something new. But I think she said something more fundamental, or at least meant to. We know that creativity and surprise are two sides of the same coin. I think "surprise me" means not just doing something new and different, but bringing creativity to bear so that learning what you need or want to know becomes intriguing, delightful, interesting and makes you want to know more.

In the timeframe of "now," I'm hoping there will be some aspects of my talk this evening that will surprise you and make you want to know more. In the timeframe of "nowadays," we will continue working to make the Smithsonian more intriguing, so that it over the "long now" it makes a substantial contribution to a broad slice of life on planet Earth.

Conventional wisdom says that a good speech has three points, so I am going to divide this talk into three parts. The first could simply be called the "now" and includes a little bit about who we are and what we do. The second could be described as "the very long now of the past," which will touch on a few current Smithsonian projects that focus on gleaning knowledge about the past. The third I would call "the long now of the future," which is what we are ultimately about.

The Smithsonian owes its existence to a British scientist named James Smithson, who bequeathed his estate to the United States for "the Smithsonian Institution, an Establishment for the increase and diffusion of knowledge." 163 years later, we are still focused on the dual missions of research and education. Our education mission is the more visible of the two. Most people see us through the lens of our 19 museums and the National Zoo. More than 25 million people visit these facilities each year. Others who subscribe to the Smithsonian Magazine have an awareness of our 20 libraries and the work of our research centers and programs in 88 countries around the world.

Thousands of teachers and students across the United States and around the world know us for our educational initiatives like the Encyclopedia of Life, which is developing a web page for every living species on the planet, and for the interactive online seminars we have just begun. The first seminar last February was about Abraham Lincoln. It was a pilot, so we didn't put a lot of effort into publicizing it. But it attracted 4,200 participants from all 50 states plus almost 70 countries. We'll do another one soon on global warming.

Still others have met us online in social spaces. They play online games with names like "Meet Me at Midnight" and "Ghosts of a Chance" that have been created by the Smithsonian American Art Museum. Or they check out the more than 1,500 photographs we've posted on Flickr Commons, which serve as a gateway to our own websites.

All of these avenues of education and communication point to the vast collections of material objects and data that the Smithsonian has amassed since it came into being in 1846. In a very real sense, the Smithsonian Institution is the curator of the world. Our infrastructure stretches around the globe and out into the cosmos to capture new information and collect what is worth preserving.

It is a challenging task. Out of all the material objects that make up our world, out of all the information that is flashing past us in bits and bytes, how do we decide what to grasp and hold fast and preserve? Some things are unique and spectacular and obviously deserve to be collected and preserved. But many things in our collections were rather ordinary in their day and have taken on significance through time.

Take, for example, our collection of animal specimens. The Smithsonian got into taxidermy right from the start, and we have amassed quite a collection. But recently it has taken on new meaning as DNA testing has become available. Our collections are contributing to the world's genetic database and the barcode of life, which enables the rapid identification of new species.

We can also serve unexpected needs, such as when a U.S. Airways jet collided with birds and had to make an emergency landing in the Hudson River. All it took was a few feathers from the damaged jet engines for the Smithsonian's experts to identify the birds.

At a deeper level, the essence we are searching for in everything we collect and in all of the research we do is meaning. We want to capture what it means to be human, and to gather a collective statement of how our society understands and remembers itself. Then we want to put that meaning into the larger context of the unfolding of the universe.

As a result, we care about more than just the objects or the facts themselves. Much of our search for meaning is vested in connections and relationships. These are relationships between humans and the tangible objects in the immediate world of our everyday life that over time constitute our identity and culture. There are also relationships between human beings and the larger context of the planet and the universe. Our search for meaning brings history, art, and the sciences into relationship with each other—a unique effort to connect the left and right sides of the brain that we continue to develop.

The relationships between humans and the objects that comprise our world are invariably sensory, because that is how we humans experience the world—by looking, listening, smelling, tasting, and touching. But in many cases, the sensory skills humans apply to that task are limited. The work of the Smithsonian offers opportunities for a fuller and more creative range of exploration of our sensory relationship with the real world around us.

For example, we usually concentrate on sight and touch in our exploration of the world, and underutilize the sense of hearing. What are we missing when we do that? Think of a potter turning a vessel on a wheel. The wheel is spinning round and round, and as the potter manipulates the clay tiny grooves are etched. What if we thought of that spinning pot as a three-dimensional phonograph record and put a record needle to its tiny grooves? What would we hear?

Or take Mickey Hart, drummer for the Grateful Dead, who recently visited the Smithsonian Air and Space Museum and asked this question, “Have you ever heard the universe?” Astronomers are focused on looking at the universe, not listening to it. But the sun actually broadcasts acoustic energy. And the mathematical equations that describe the oscillations of the sun’s acoustic energy are the same as the mathematical equations that describe the oscillations of musical instruments here on earth. How can we hear the music of the sun, and what does it sound like? Questions like these that help to make the work of the Smithsonian fascinating.

I was born in the small town of Douglas, Georgia, and grew up in the Deep South. Along the way, I gained an appreciation for southern writers, and one of my favorites is William Faulkner. I’ve read everything he wrote, and as I learned about the timeframe of the Long Now, I thought back to the words of a young man named Chick Mallison in Faulkner’s novel “Intruder in the Dust.” He said, “Tomorrow began ten thousand years ago.”

To Faulkner I would add the words of Winston Churchill, who said, “The farther backward you can look, the farther forward you can see.” We believe that at the Smithsonian. Our long-term thinking is based on the premise that the history of the universe and of planet Earth and its inhabitants is a relevant guide to the future.

We are time travelers at the Smithsonian. We spend considerable effort looking back through time, back even farther than 10,000 years, for clues that will help us understand the present and anticipate what might happen in the future. Tonight I would like to invite you to travel back into the very long now on the Smithsonian timeline, as defined by a handful of examples of our efforts to uncover and understand the past.

As we look back through time, our scope begins quite close at hand with ourselves as Americans, and then broadens out as we go until it encompasses the entire universe. The first stage of the

journey focuses on the human experience. After all, we humans are quite new, existing for just the last 5 million years of the 14 billion year history of the universe.

On the Smithsonian timeline, the most recent period is the past 300 years, which represent our efforts to capture the essence and meaning of America's identity through the study and collection of artifacts and art that document our history, culture, ideas and achievements.

Artifacts are an important way to connect people with their heritage and identity. They help successive generations to relive the experiences of their forebears in their imaginations. At times they reveal surprises, like Lincoln's gold pocket watch. The watch was already in the Smithsonian's collection for many years when a story surfaced about a jeweler who was repairing it in 1861 when the news of the Union attack on Fort Sumter reached Washington, D.C. The story claimed the jeweler engraved a secret message under the face of the watch. When curators carefully dismantled the watch just a few months ago, there it was—a message supporting the abolition of slavery.

Few things are more American than the star spangled banner. The actual flag that flew over Fort McHenry and inspired Francis Scott Key to write our national anthem was put on display at the Smithsonian's National Museum of American History when it opened. That flag is now almost 200 years old, and we recently completed a ten-year project to conserve it. The point was not to restore it to its original condition, which would have obliterated its history, but to clean and stabilize the fragile fabric, while at the same time preserving the marks of two centuries and the many hands that cared for it.

One of the most appealing exhibits at the National Air and Space Museum is the spacesuits, to which visitors relate on a very personal level. They look at the spacesuit John Glenn wore as the first American to enter space on Feb. 20, 1962, and they imagine what it must have felt like to put it on and orbit the Earth. These special garments that were designed to protect astronauts from a very harsh environment are actually rather delicate and tend to deteriorate quite quickly. Care and conservation is very important in our efforts to share the history of space exploration with Americans today and in the future.

Art captures another aspect of our personality as it conveys to us the perspectives, ideas and emotional tenor of its time. The Smithsonian American Art Museum is presently featuring an exhibit called "1934: A New Deal for Artists". This artwork from the Great Depression reminded the nation of traditional values such as hard work, community and optimism. Today it gives Americans, who are once again in a rough economic time, an opportunity to reconnect with that experience, remember that the nation has survived tough times before, and endured and thrived. For those who cannot make it to the museum, we have uploaded 400 images to Flickr Commons and created an online educational website about the 1930s.

If we take a step back in time along the Smithsonian timeline to roughly 30,000 years ago, our horizons broaden to the first humans to arrive in the Americas. The Smithsonian has been studying the native peoples of North, Central and South America, including the Caribbean, for many years and has one of the most extensive collections of artifacts and art in the world. This research and collecting, which is the focus of the new National Museum of the American Indian, touches about 1,200 different cultures that extend back more than 12,000 years.

We are focused on the connections and relationships between the people and the land and on preserving the aesthetic achievements of these past cultures, as well as providing opportunities for today's artists to showcase their work.

Of course, art is an outgrowth of the concept of using symbols, which humans developed some 300,000 years ago. The use of symbols was the dawn of a new era in the relationship of humans with the world around them. It vested a new level of meaning into objects, and it enabled the development of language. The Smithsonian's earliest efforts at cultural preservation included the preservation of languages, because language is the embodiment of culture—defining cultural life and contributing to its subtleties. Language is also the way we have historically preserved the record of our experience and achievements.

"Recovering Voices" is a long-term effort by the Smithsonian to capture the look, sound and structure of endangered languages before they disappear. We have built a record of literally hundreds of languages that are no longer spoken. One of our prized possessions is a set of cards made by Thomas Jefferson, translating Indian language into English. We have a natural empathy with the Long Now Foundation's Rosetta Disk project, and we consider ourselves to be your partners in that effort.

Our next stop on the Smithsonian timeline is about 5 million years ago when the very earliest hominids began to walk around Africa upright on two feet. The Smithsonian began studying Paleolithic materials in 1869, and has amassed a sizable body of research and artifacts documenting the earliest humans. Next year we will open a new exhibition on the origins of humans, which has been under development for about 10 years.

Of course, skulls have always been an important way of showing the progression of human development. But we also pay attention to hands and feet, which changed significantly as our ancestors moved down out of the trees to live on the ground. For example, the big toe no longer needed to function like a thumb, and shorter toes are required for running away from predators than for grasping branches. A few years ago it was the expertise of Smithsonian anthropologists in hands and feet that enabled us to identify the remains of Homo floresiensis, known as the hobbit, as a different line from the Neanderthals and early humans.

The exhibition on the origins of humans will also put them into a broader context, with a special focus on the impact of climate change on their survival, migration and adaptation.

Now, let's step back along the Smithsonian timeline to about 55 million years ago when the Eocene Epoch was just beginning. This is the moment when our own earliest primate relatives first showed up, as well as the earliest ancestors of horses, sheep and pigs. They didn't just appear on the radar screen. They rapidly became dominant in numbers as well as rapidly diversifying and their descendents continued to be dominant for millions of years. However, today many animal species are disappearing, so the Smithsonian's preservation efforts include living animals that face extinction.

One of them is Przwalski's horse, the last remaining truly wild horse in the world. The wild horses on the American and Australian plains and islands like Chincoteague and Cumberland are from the same genetic line as domestic horses. In contrast, Przwalski's horse has 66 genes—two more than domestic horses.

All of the Przwalski's horses alive in the world today are descended from 14 individual horses that were snatched from the brink of total extinction. As a result, their continued survival is threatened by a lack of genetic diversity, and the National Zoo maintains a breeding population at a 3,000-acre breeding facility for endangered species.

To understand the larger context of the emergence of the earliest mammals 55 million years ago, we go to the Bighorn Basin, located in Wyoming's Badlands—a place where towns have names like Buffalo and Greybull and the local brew is a tasty dark ale called Moose Drool. The Bighorn Basin is a unique place because it was formed as the Rocky Mountains were simultaneously rising up and eroding away. The rivers eroding the Rockies laid down thick layers of mud in the Bighorn Basin, which subsequently eroded into badlands, so that the rocks and fossils of millions of years ago are quite close to the surface here.

I went to the Bighorn Basin just a few weeks ago to visit the Smithsonian researchers who have been digging here for more than 30 years. The paleo-biologists among them are not looking for dinosaur bones, but rather for plant fossils. Their discoveries are making an important contribution to our understanding of global warming.

Smithsonian researchers in Polar regions study global warming by boring deep into glacial ice and removing a core that was laid down over the course of thousands of years. A really good ice core will allow you to see back as far as 800,000 years. However, the past million years are a relatively cool period in the history of the planet. If you only look at this timeframe, you might come to the rather unsettling conclusion that our current trend toward global warming could be unprecedented.

But if you use leaf fossils to look back 55 million years, you get a different perspective. The Earth at this time was in a 30-million-year warm period—warmer than it has been at any time since then. As the Paleocene Epoch gave way to the Eocene, things heated up even more. The earth entered a period of relatively rapid global warming called the Paleocene-Eocene Thermal Maximum, which lasted about 200,000 years. During this time, the average surface temperature of the Earth rose by four to eight degrees Celsius, and the carbon dioxide in the atmosphere reached levels that are almost triple those of today.

The type, size and features of fossilized leaves provide a rough thermometer of temperatures and a rough rain gauge, as well as a measure of plant migration driven by climate change. What the Bighorn Basin plant fossils indicate is that 55 million years ago during the Paleocene-Eocene Thermal Maximum, the equatorial tropics moved north, covering all of the United States. The change was so rapid that in terms of a geological clock, it was like going to bed in my home state of Georgia and waking up the next morning in southern Mexico. As global warming has become an increasing concern for the long-term future, the Smithsonian's collection of leaf fossils from the Paleocene- Eocene Thermal Maximum are an important resource for the future. I'll say a little more about that in a few minutes.

As we take another next step back in time, we leave the Earth for outer space, to study the development of our solar system, our galaxy and the universe itself. The Smithsonian's first secretary was a physicist who set the Institution on a course that has made the Smithsonian Astrophysical Observatory the largest and most diverse astrophysical institution in the world. We operate telescopes in Hawaii and Arizona, and are partners with an observatory in Chile. We

also operate space-based telescopes like the one shown here.

Telescopes are time machines. In the course of a year, light travels 5.9 trillion miles. This is a light year—the common measure of distance in outer space—but it is also a measure of time. For example, this recent picture from the Smithsonian's telescope in Arizona shows the Whirlpool Galaxy, which is 20 million light years from Earth. The collision you see here reflects how things looked 20 million years ago.

As we explore the history of the universe, one of the most intriguing questions is whether it contains other planets similar to Earth that are home to living organisms. This question is the focus of the Kepler Telescope, a joint project of NASA and the Smithsonian, which was launched into orbit in March. For the next four years, Kepler will scan the Milky Way to detect and categorize planets that are in what NASA calls the "habitable zone," which means they meet the requirements for life. To qualify, they have to be just the right size and just the right distance from their star with just the right orbital path. Kepler will continuously monitor 100,000 stars that are similar to our sun, watching for orbiting planets to pass across their faces. Data from these planet tracks will provide evidence about their size and orbital path, which will allow scientists to focus in on the most likely suspects for further investigation.

The Kepler project is listening as well as looking, because other stars like our sun might just be broadcasting acoustic oscillations as well. Kepler has already identified some promising prospects, so stay tuned for more news about life on other planets!

As we move even farther back in time on the Smithsonian timeline, we turn once more to the Smithsonian collections and the Allende meteorite. This meteorite, which was discovered in northern Mexico by Smithsonian field staff in 1969, is the oldest known natural specimen in the world and is the oldest object in the Smithsonian's collections. It contains some of the very first matter to condense out of the Solar Nebula when our solar system formed more than 4.5 billion years ago, and it revolutionized scientists' thinking about that event. It also contains tiny diamonds from the super nova explosions of other solar systems, as well as amino acids that are not part of our natural world here on Earth. The wealth of significant information it brought us has caused some to call the Allende meteorite the "Rosetta stone of planetary science."

We end our journey back through time on a barren, windswept mountaintop in Chile, 8,000 feet above sea level in a climate so dry that very little grows. The air is crisp and clear, devoid of the moisture that clogs the sightlines in most places on Earth. I have never seen a night sky that was more spectacular. We are at the Las Campanas Observatory, where the Smithsonian is a partner in a pair of powerful Magellan Telescopes. It is the only place in the world I know of that has signs reserving parking spaces for astronomers.

Over the course of the next decade, a Giant Magellan Telescope will be built here at Las Campanas by an international consortium of which the Smithsonian is a member. This powerful new telescope will allow us to see stars and universes ten times more clearly than the space-based Hubble Telescope. Not only will we gain a clearer picture of what happened in space millions of years ago, but as we look even farther out into the universe, we will at the same time be looking farther back in time—coming ever closer to the timeframe of the Big Bang, which scientists believe occurred about 14 billion years ago. The future discoveries enabled by the Giant Magellan Telescope will speak to the origins of the universe and may well change the way

we see ourselves and think about our planet.

It's human nature to focus on our differences. People do that on an individual level in their daily lives, and we began this Smithsonian timeline with the celebration and preservation of unique cultures and languages. But as we journey back in time, those differences fade away, and we are reminded that in the infinite scheme of the planet and the universe, such differences are superficial. We are all from Africa, and we are all made of stardust that traces back to the formation of our solar system and beyond.

Now that we've taken a quick journey on the Smithsonian timeline back to the origin of the universe, what about the long now of the future? Of course our extensive collections come from the past and the present, but as we look forward, the Smithsonian's breadth of interests and expertise provide a unique opportunity for collaborative long-term thinking both across disciplines and around the world. Let me give you two examples from the Smithsonian's work on ecosystems.

We begin in Kenya, the same country where Smithsonian anthropologists are researching the emergence of the world's first human beings. However, this time we go to Mpala—to a wildlife research center that we were instrumental in establishing on a preserve of 48,000 acres of African savanna.

Our purpose here is to help find ways to sustain a complex ecosystem that includes human beings as well as a diverse and exotic population of flora and fauna. My recent visit to the Mpala wildlife preserve began with elephants and ended with ants. The research center views the ecosystem as a whole, and because of this the relationship between these large and tiny residents was immediately clear. The ants live in bulbous hollow knots at the joints of the acacia trees and boil out at the slightest tap, ready to inflict painful bites. Their protection allows the acacias to survive and thrive, ensuring a food source for the elephants.

Food is important here, because the Mpala reserve is surrounded by Maasai farmers. Their livestock compete with wildlife for food, resulting in over-grazing, and their fences cut wildlife off from water sources. Any plan to conserve the land and the wildlife must also include the cooperation and well-being of the local community. In addition to the wildlife research at Mpala, programs include mobile health clinics, the development of cottage industries and support for local schools. If all parts of the ecosystem—humans as well as wildlife—can adapt to each other, then the chances to survive and thrive in the long-term are improved.

From the plains of the African savanna, we travel to Panama, where the Smithsonian has been studying tropical forest ecosystems for more than 75 years—not long by Long Now standards, but longer than anyone else. The Smithsonian Tropical Research Institute is the world's premier tropical biology research organization.

Our studies have made it clear that tropical ecosystems are incredibly dynamic and responsive to climate change. We are creating the Smithsonian Global Earth Observatories—a network of forest research plots across the Americas, Africa, and Asia with a strong focus on tropical forests. We are training researchers and staff at each of these sites to use the same methodology, so that the data can be compared around the world.

The goal is to keep a hand on the pulse of the planet by monitoring the long-term growth and

survival of more than 6,500 species of trees and the ecosystems that exist in and around them. The result should be a better understanding of forest ecosystems and a widespread documentation of the effects of climate change and the ways it ripples through the intricate web of natural ecosystems.

Philosophers and historians have argued for millennia about whether history actually repeats itself, but I think Mark Twain got it right when he said, “History doesn’t repeat itself, but it does rhyme.” At the Smithsonian, we are looking for those deep, underlying rhythms and cycles that will help us prepare for the long now of the future.

For example, when we look back through the history of the planet and at the major global challenges facing us today, climate change is a common thread and driving force. That will also be true in the long-term future. So it is a good idea to learn as much as we can about the underlying, long-term rhythms of global warming and climate change.

Predicting the future of global warming is still a very inexact science, and the patterns and impacts of the resulting climate changes are not well understood. Global warming and climate change affect the actions and reactions of a complex web of systems involving air, water, ice, land and all living things. Reality is much more complicated than the computer models scientists have developed to date.

As Smithsonian paleobiologist Scott Wing indicates, we still have a lot to learn. A significant portion of that operator’s manual is carved in stone—in the fossils of the Bighorn Basin, where Scott has been working for more than 30 years. The evidence from 55 million years ago contained in plant fossils is giving scientists a better understanding of global warming and helping them test and adjust their computer models for the future.

We are also learning that we might be approaching modeling with the wrong assumptions. We have traditionally assumed that the goal was optimality—figuring out how to sustain the best possible configuration for the longest possible period of time. The Paleocene-Eocene Thermal Maximum implies that perhaps we should be making some different assumptions. Essentially, this time period began with about 10,000 years during which carbon boiled rapidly into the atmosphere, causing dramatic global warming. What followed was a much longer stretch of time in which the species that survived settled down to remake their lives and learn to live in this new environment. The key to survival was not optimality, but adaptability. The challenge, which our work at the Mpala wildlife reserve explores, is how to build continuous adaptability into our models.

The challenge of adaptability brings us full circle, back to the Smithsonian’s collections and the task of discerning when to hold fast and when to let go. Several months after Sept. 11, a group of Tibetan Buddhist monks came to the Smithsonian to make a sand mandala for the healing of the American people. Days of painstakingly precise labor yielded an intricate and beautiful sand painting that was seven feet square—one of the largest ever made in the West. The Smithsonian, as curator of the world, yearned to preserve it.

But after it had been on display for about two weeks, the monks went through a ritual of dismantling the mandala with brushes. They gathered up the sand in a glass jar and dumped it into the Potomac River. For them, the return of the sand to the natural environment from which it

came was a reminder of the Buddhist belief that material life is transitory.

For the Smithsonian, it illustrated once again the eternal tension between the ephemeral and the permanent. It is not always easy to discern which objects can be cast aside and which will hold meaning for the future. We take such decisions very seriously—more seriously than most collectors, perhaps because our horizons are wide, and we collect with long-term purpose.

The title of this talk, “Smithsonian Forever,” comes from this quotation from David Shayt, a beloved curator at the Smithsonian Museum of American History, who passed away last year. David collected unusual objects, some of them whimsical, that speak to our culture—bells, tools, cue sticks, crayons, Playboy Bunny costumes, lunch boxes, surfboards, and much more. He collected objects from Ground Zero immediately after 9/11 and from New Orleans after Hurricane Katrina swept through. He once explained his work with these words, and I think he spoke for everyone at the Smithsonian.

As David noted, people are optimists. They believe in the future, and they want the things that have meaning for them to live on beyond their lifetimes. It is recognition that the art and artifacts in the Smithsonian’s collections play an important role in helping to transfer identity, meaning, and understanding from one generation to the next through time.

We also think of all of the Smithsonian’s work as taking place in the context of “forever”— not only because we are engaged in a colossal effort to learn more about our history stretching back through time even to the Big Bang, but also because we believe that an understanding of that history will be a useful tool for thinking ahead into the future—into the “long now” and beyond.

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