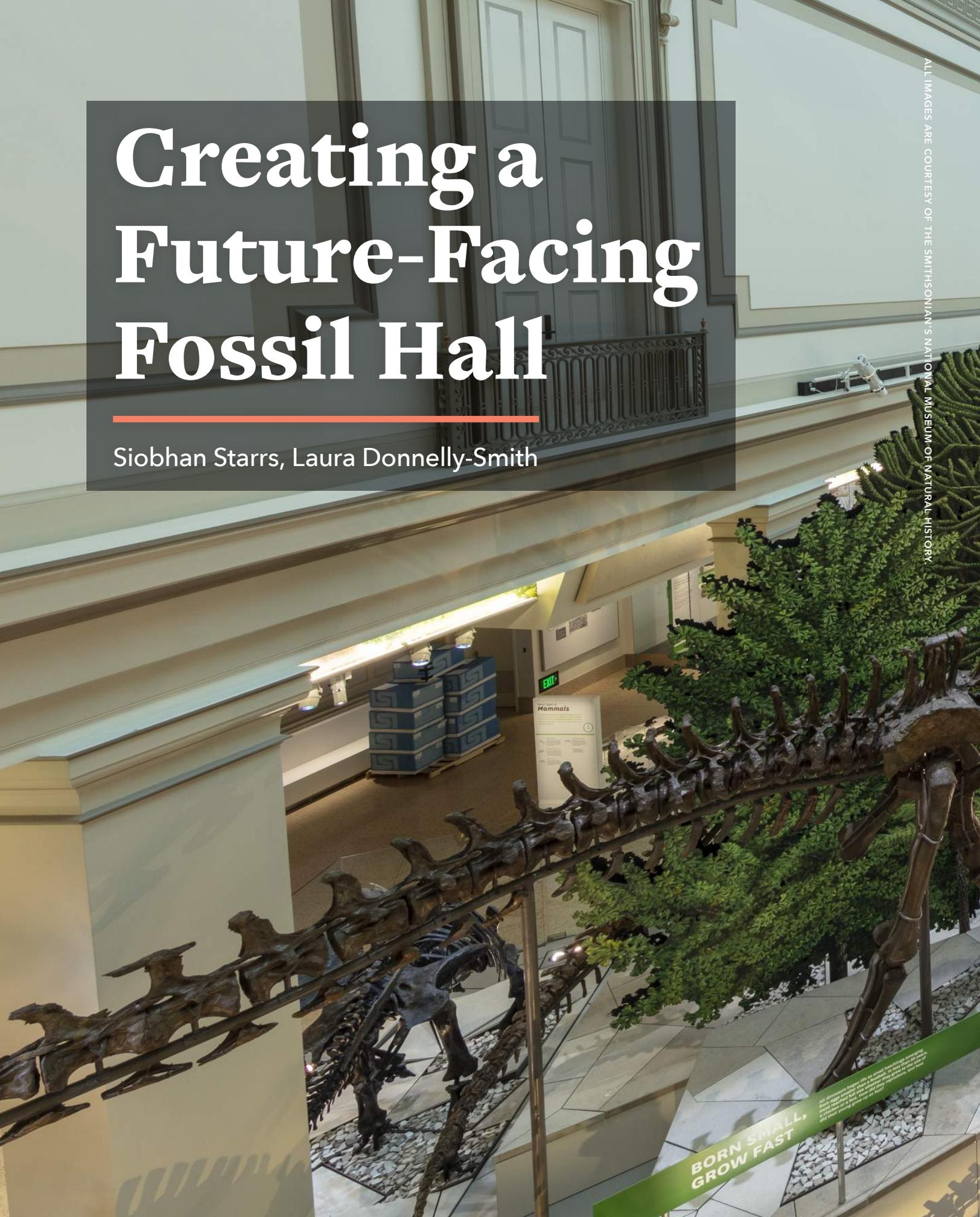


Creating a Future-Facing Fossil Hall

Siobhan Starrs, Laura Donnelly-Smith

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BORN SMALL,
GROW FAST

A view of the *Deep Time* hall from a second-floor overlook reveals the project's huge scale.



*"From so simple a beginning
endless forms must
beautiful and most wonderful
have been, and
are being, evolved."*
— CHARLES DARWIN
IN HIS ESSAY OF 1830

66
MILLION
YEARS AGO
MASS EXTINCTION

145
MILLION
YEARS AGO

201
MILLION
TO
145
MILLION
YEARS AGO

Ecosystems change as the
Earth changes and life evolves

Earth's climate has been
much warmer in the past.
**Why is climate change
a problem now?**

Fig. 1. At the hall's main entrance, visitors are invited to explore the long history of life on Earth.

The Smithsonian National Museum of Natural History (NMNH) in Washington, DC, is one of the most visited museums in the world. But in 2012, our hall of fossils hadn't received a comprehensive update in more than 30 years.

Upward of 80 percent of our visitors enter the fossil hall, and many report coming specifically to “see the dinosaurs.” The chance to completely reimagine our largest exhibition was truly a once-in-a-career opportunity, both for our scientists and our exhibition staff. It was time.

But what do fossil halls represent in the 21st century? Our team of paleontologists, exhibit developers, writers, educators, and media specialists felt strongly that a modern fossil hall must address not only Earth's past, but its future. A fossil exhibition must be more than a catalog of bygone life, regardless of how spectacular that life was. Natural history museums must foster awareness of critical issues facing our world – and today, that means addressing climate change. The message of our newly renovated fossil hall would be clear: Scientific evidence from the fossil record shows that Earth is experiencing human-caused climate change at an unprecedented rate and scale. The situation is urgent, but there is hope.

Dinosaur-sized Responsibility

Scientific research and public engagement about the causes and impacts of a changing planet are central to NMNH's identity. To

fulfill the museum's mission to “understand the natural world and our place in it,” our exhibitions must address humans as *part of nature* – both driving and being affected by change.

The National Museum of Natural History occupies a unique place as part of the Smithsonian Institution, the massive research and education complex in Washington, DC – and an internationally trusted brand. Admission to all Smithsonian museums is free of charge, and annual visitors to NMNH exceed 5 million. Our main museum building is the size of 18 football fields, and our fossil hall, our largest and most visited exhibition space, is 31,000 square feet and located prominently off the main rotunda.

Unlike many museums, we receive huge numbers of visitors simply because the museum is on the National Mall and part of a revered institution. This combination of brand, location, and audience reach gives NMNH a tremendous platform – and tremendous responsibility.

The core team of paleontologists and exhibit professionals leading the renovation of our fossil hall, officially titled the *David H. Koch*



Hall of Fossils–Deep Time (*Deep Time* for short), took this responsibility seriously when we got to work in 2012 ([intro image](#)). Our exhibition development schedules are typically longer than at most museums, but with seven years until opening day in 2019, this one was extraordinarily long – even for us.

We had a very big job ahead of us. In addition to the challenges of conserving and remounting priceless fossils, we needed to ensure visitors would understand that while Earth and life have changed together for millennia, the changes that have happened since modern humans evolved have been different: much faster and much larger in scale. This was complex and nuanced messaging.

Starting with the Science

The scientists on our exhibition team study how life (including humans), climate, and Earth systems have changed over hundreds of millions of years ([fig. 1](#)). More importantly, they are all deeply engaged in research about why these changes matter today.

Our exhibition developers brought knowledge of our visitors’ expectations and needs. Audience research indicated that visitors seek experiences that tell human stories and help make personal connections. They are more likely to remember conservation messages when they can identify specific solutions or role models to emulate; and they desire help understanding



how science is personally relevant.¹

Armed with this information, team members chose the main message of the new exhibition: **Studying the past informs our understanding of the present and the future.** Paleontology – the study of life in past geological periods, as known from fossil remains – answers a critical question: If Earth’s climate has changed in the past and the planet has been resilient, why is change a problem now? The past provides the answer: Climate change today is happening at an unprecedented rate and scale, and is driven by a single species – us.

1 RK&A, Formative Evaluation: *Deep Time* Multimedia, Carbon Animation, Ice Core Video, Ecosystems Interactive, and View Interactive, National Museum of Natural History, 2017; RK&A, Formative Evaluation: *Deep Time* Extinction Walls and Anthropocene, National Museum of Natural History, 2014.

Paleontology provides the long view on human-environmental impact and a way of making sense of the daunting rate of changes around us. This “deep time” perspective could potentially cause a radical shift in public awareness and highlight the fact that humans can still prevent a worst-case scenario for our species and our planet – if we act immediately.

Getting to “Urgent Hope”

Our iconic fossils – the *T. rex*, *Diplodocus*, mastodon, and giant ground sloth – can do visitor engagement work all on their own, even if we skipped the interpretive labels. But developing compelling stories about the constancy of change over time (versus how climate change today is different) took

Fig. 2. The *Last American Dinosaurs* exhibition showcased compelling fossils within a “work-in-progress” space.

more work. How could we show our visitors that life and the Earth itself are inextricably linked, and have been evolving together for 3.7 billion years?

Our core team, working with exhibition designers and media developers from Reich+Petch Design and Richard Lewis Media Group, examined Earth’s history period by period, discussing what was most vital for visitors to understand. Some important reoccurring topics quickly emerged: evolution, ecosystems, extinctions, and earth systems. Because all these topics shared themes of constancy and interconnection, we used them to link important stories throughout the exhibition: through the past, into the present, and into a “deep future.”

We also invested in audience research, using as many methods and resources as possible within our budget and schedule parameters. Prior to the design kick-off session in 2012, we conducted rapid-idea-generation sessions around climate content with museum stakeholders and visitors. And the Smithsonian Office of Audience Research conducted exit surveys of the old exhibition to assess the visitor experience and expectations.

After the project launch in 2012, we contracted with audience research firm RK&A to conduct multiple front-end and formative surveys over the length of the project that tested our main messages, floorplan and wayfinding, specific graphics, and multiple media pieces. We brought on a contractor and utilized the Smithsonian Affiliates Program to conduct market research to assess visitor expectations for the museum’s fossil hall and to test exhibition title options.

And for six years, we partnered with the George Washington University Museum Education Program to conduct annual summer evaluation projects as part of the graduate students’ thesis work. Most importantly, team members – including our curators – took every opportunity to get out on the floor and talk with visitors.

The museum created a temporary fossil installation called the Rex Room and, later, a bigger temporary exhibition called *Last American Dinosaurs* (fig. 2) to satisfy visitors’ desire to see dinosaurs over the five years the main hall was closed. We were lucky to have these settings in which to test and refine our stories, design approach, and programming.²

We learned a few things right away:

- Terminology like “Anthropocene,” (which means “Age of Humans”)³ and “global warming” could obstruct visitor engagement – the first because it’s unclear, and the second because it’s highly politicized in the media.
- Visitors had fundamental misconceptions about the term “fossil fuels,” not realizing that coal and oil are not just very old – they are *literally* composed of fossil plants and animals, and were formed in the Earth over millions of years.⁴

As a result, we committed to using plain language and explaining important scientific terms succinctly throughout the exhibition.

² RK&A, Summative Evaluation: *Last American Dinosaurs*, National Museum of Natural History, 2015.

³ Elizabeth Fernandez, “Is a New Geological Epoch Beginning – the Anthropocene?” *Forbes*, December 15, 2019, www.forbes.com/sites/fernandezelizabeth/2019/12/15/is-a-new-geologic-epoch-beginningthe-anthropocene/.

⁴ RK&A, Formative Evaluation, *Deep Time*, 2017.

Fig. 3. Design elements like extinction markers, wayfinding graphics, and models punctuate the main path in regular intervals to aid visitor navigation.

Numerous natural history museums have done groundbreaking work around communicating climate change, including the Deutsches Museum, North Carolina Museum of Natural Sciences, Carnegie Museum of Natural History, and Utah Museum of Natural History. Their staffs were generous in sharing lessons learned. We also spent significant time reviewing the work of effective climate-change research organizations, including the Yale Program on Climate Change Communication, George Mason University’s Center for Climate Change Communication, and the FrameWorks Institute.⁵

We conducted team workshops with social-learning expert Per Espen Stoknes, author of *What We Think About When We Try Not To Think About Global Warming: Toward a New Psychology of Climate Action*. We learned that many people feel overwhelmed, depressed, and hopeless when consuming content about the far-reaching and negative effects of climate change, and tend to “shut down” and try to find ways to avoid the content. Others ask, “What can I do?” and are met with overly simplified answers, such as to recycle or combine car trips.

We came to realize that in order to make a real impact, our exhibition needed to do two things. First, it needed to emphasize, in the words of Anthony Leiserowitz, the director of the Yale Program on Climate Change Communication, “Scientists agree: It’s real. It’s us. It’s bad. But there’s hope.”⁶ Second, it needed to provide a healthy serving of that hope, by showing real people making scalable changes in the world – changes that our

⁵ For more information about these organization, visit their websites: climatecommunication.yale.edu; www.climatechangecommunication.org; and www.frameworksinstitute.org.

⁶ Anthony Leiserowitz, “Climate Change in the American Mind,” June 2017, Citizens’ Climate Lobby keynote speech, 7:42, https://www.youtube.com/watch?time_continue=15&v=T-JVKqpvt2c.

We called the tone of the *Deep Time* exhibition “urgent hope.”

visitors would understand to be both science-based and highly practical.

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A Journey Through Time

We know our visitors are often pressed for time and visit as part of self-guided, grand tours to “do the Smithsonian.” So every portion of the exhibition needed to be easy to understand, even at a glance. The *Deep Time* story is one of continuous connections over millions of years, and the exhibition design emphasizes this connectivity. Specimen displays curve through the gallery in radiating bands. Visitors can follow the gallery’s wide, central pathway on a journey backward through time. Side “alleys” draw visitors to more intimate spaces that deepen the journey (fig. 3).

Wayfinding and introductory graphics help visitors navigate both where they are in the exhibition and *when* they are in time. At specific moments, exhibits are disrupted by tall “extinction walls” that signal abrupt planetary changes in a dramatic way. Three-dimensional models and detailed murals depict animals in ancient ecosystems and distant views to the sky. Miniature dioramas of ancient life invite visitors to feel immersed in moment from the deep past.

**"In nature,
nothing
exists alone."**

—RACHEL CARSON
MARINE BIOLOGIST, 1962

**ICE-AGE HUMANS:
PREDATORS AND PREY**

Having the most recent Ice Age, we often forget the years, trees, and fields. We have forests and fields that were once large grasses, open woodlands, home to many large animals. For large predators to continue to exist, we need to take care of our prey. Today, we use the top predators, and we change the ecosystem and due to be used for species.



HUMANS SPREAD, EXTINCTIONS FOLLOW



The arrows on the map indicate the routes modern humans took to migrate out of Africa. As they spread across the globe, **ecosystems changed in their wake, and extinctions usually followed.**





Fig. 4. This wall maps the pattern of large mammal extinctions that occurred as humans spread across the globe.

We made sure that throughout the exhibit, visitors would encounter authentic, relatable real people experiencing climate change and working for a better future.

Our writers crafted catchy label copy – “Worst Extinction Ever,” “Giant Dinosaurs, Living Large” – and tight descriptions of the main point for each area. Reich+Petch positioned these phrases on brightly colored “ribbons,” placed at eye level near compelling fossils, where they were easy to find.

We approached challenging stories (like human-caused extinctions or fossil fuel use) as straightforwardly as we could, using direct statements of facts and consequences. We also distributed these stories throughout the exhibition, making them tough to avoid. These strategic decisions stemmed from our conviction that it was the museum’s responsibility to emphasize the role of humans in changing the Earth (fig. 4, p. 44-45).

But we also wanted our visitors to feel welcome, respected, and comfortable, even when grappling with challenging subjects. No one enjoys feeling intimidated or undereducated, and a trip to a massive, crowded, science-forward museum may be disconcerting for some visitors. To help

more visitors “see themselves” in the faces featured in the exhibit, we sought the most diverse group of scientists we could find. And to ensure their messages would be easy to understand and compelling, we used first-person formats and direct, jargon-free language whenever scientists described their work – whether in exhibit text or multimedia presentations.

We made sure that throughout the exhibition, visitors would encounter authentic, relatable real people experiencing climate change and working for a better future. This was particularly important for our “How Are We Changing the Planet?” theater show, a set of five short, original films, each pairing citizen observations with scientific- and community-based solutions.⁷ Anecdotally and through informal tracking observations, these films seem successful: we see audience members sitting for one or even two to three of the films, which feature locations from Chicago to New Orleans to West Texas to Hawai’i (fig. 5).

The “Love. Protect. Act.” interactive experience provides a starting point for visitors asking, “What can I do?”⁸ It highlights simple changes and choices made by real people that are highly scalable for more significant results, from a school district that did away with buses and got every child walking to school to a soccer club that banned pesticides on its playing fields. The goal is not for didactic mimicry, but for visitors to consider the impact of actions (or inaction) and spark innovative thinking that breaks through hopelessness in the face of a global challenge.

⁷ Films were produced by Kate Raisz of 42 Degrees North Media, <https://42degreesnorth.com/>.

⁸ RK&A, Formative Evaluations, *Deep Time* Age of Humans Multimedia, Phase 1 and 2, National Museum of Natural History, 2018.

Fig. 5. The Age of Humans theater presents five stories focused on the “urgent hope” theme, shown in a space designed for follow-up, facilitated dialogue.



Museums are powerful platforms, and with great power *does* come great responsibility to engage and inform our visitors on the critical issues facing life today.

Beyond Opening Day

Deep Time opened to the public on June 8, 2019 and since then, we've been building on the lessons we've learned by gathering feedback from colleagues in the field, evaluating our approaches, and listening to our volunteers and visitors.

Early anecdotal and summative work shows that our message is resonating. Visitors are reporting interest, surprise, and engagement with the message that studying the past tells us that humans are changing the planet today. A professor from Syracuse University called the exhibition, "The clearest and finest explanation of life on earth and our future I have ever seen." An out-of-town guest wrote, "The *Deep Time* exhibit is so great, with loads to look at and read and interact with.

It entertained three generations of my family easily, plus I appreciated the multiple ways human caused climate change was embedded into the displays." And another visitor created an Instagram *Deep Time* climate content story: "Earth's climate has been much warmer in the past. Why is climate change a problem now?" Swipe through the @smithsonianmnh #FossilHall to find

out what makes the current climate crisis different."

But there's always room for growth and change.

1. The most-reported complaint is unrelated to climate change. Visitors have trouble understanding the drawings of fossil specimens we provided; they can't tell what is real versus what is a cast. The team is working to improve these graphics.
2. While the hall's climate change content can stand on its own, we felt that we could make even more strides into visitor understanding – and critical conversations – with facilitated discussions like those offered at the Science Museum of Minnesota, the Tenement Museum, and the National September 11 Museum and Memorial. Our education team is working to develop specific activities for school groups, adults, and families that will encourage visitors to engage more deeply with content and learn from each other's perspectives.
3. The museum is continuing to explore innovative ways to communicate climate-change messages and refine our best practices. The opening of a new modern-art-and-natural-history hybrid exhibition called *Unsettled Nature* in spring 2020 marks our first use of art as a point of entry into human-driven climate change. We are also currently developing new public programs for the 2020 Earth Optimism and Earth Day events in Washington, DC to refine and expand our suite of public engagement offerings.

Deep Time reflects years of intellectual and emotional effort from a large, invested, multidisciplinary, and passionate team at NMNH. But we – and now every one of our visitors – are indebted to the many interns, fellows, contract consultants, and peers from across the Smithsonian and other organizations who shared generously with us along the way.⁹

Museums are powerful platforms, and with great power *does* come great responsibility to engage and inform our visitors on the critical issues facing life today. Natural history museums are safe keepers of both our planet’s story and the most current scientific research, and must live up to our best ideals in the face of the current climate and biodiversity crisis – or imagine a day when our cabinets of curiosity lie empty or contain many more extinct specimens.

We hope *Deep Time* is a call to expand and build networks for museum professionals to work together on such critical topics, and to build a community committed to nurturing planet-savvy citizens. To do this, institutions will need to share more openly our successes, struggles, and failures, and to bring in social scientists, psychologists, and other non-museum experts who bring much-needed new perspectives, backgrounds, and ideas.

⁹ With particular thanks to Reitch+Petch Design and Richard Lewis Media Group.

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