

Soil is so misunderstood. Many people think of it within the limited context of their backyard or simply as “dirt.” Yet without soil, life on land would not exist as we know it. The soils under our feet are a vast reservoir for life and play a part in almost every aspect of human existence—food, housing, clothing, medicine, ecosystems, and much more.

This month, soil will take center stage in a 5,000-square-foot exhibition at the Smithsonian’s National Museum of Natural History (NMNH) in Washington, DC. The educational, interactive exhibition called *Dig It! The Secrets of Soil* opens on 19 July and will run through January 2010. A planned national tour to museums around the country and in Canada would begin later in 2010, depending on sponsorship. More than six million people a year visit the NMNH, and so this should go a long way towards cleaning up soil’s “dirty” image and informing the public about its importance.

“This is one of the best opportunities we have to show the world how basic soils are to life,” says Gary Peterson, president of the Soil Science

Society of America (SSSA), the exhibition’s founding sponsor. “I don’t think people really respect soil. The reason for that is they don’t understand what it’s doing for them. The idea that it’s a filter for water and the place where we recycle biological materials—all those kinds of things will become very plain to them when they see this exhibit.”

Unknown to one another at the time, separate visits to NMNH eight years ago simultaneously inspired SSSA members Patrick Drohan and Tom Levermann (now deceased) to approach NMNH with the idea of developing a new exhibition about soils. Museum staff members were excited about the possibilities and organized brainstorming meetings with SSSA, USDA-NRCS, and others to talk about what could be done.

“During the brainstorming, what came out was just the incredible range and extent of ways in which soil affects our lives, the fact that it has biological and geological importance, and the cultural connections,” recalls NMNH’s Barbara Stauffer, the exhibition’s developer. “We like to do exhibits that take that interdisciplinary view.”

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Building Appreciation for Soils

Several SSSA committees were formed including the Design Committee, which worked with the museum during the exhibit’s initial concept development. A Development Committee began fundraising efforts, and in just eight years—quite fast by pedogenic standards—the idea has grown from the fanciful musings of a few enthusiastic soil scientists into a reality. The exhibition is the culmination of an unprecedented effort by SSSA members and the greater soils community to build an awareness of and appreciation for soils.

“In my view, soils represent the biggest gap between the importance of a natural resource and its appreciation by the public,” says Pat Megonigal, lead curator of the exhibition and SSSA member. “When you think about all of the services that soils provide and what the public understands about this resource, the gap is much larger than it is for water, air, or any other major resource that we depend on. The benefit of the exhibition is to close this huge appreciation gap.”

There’s no shortage of appreciation from SSSA and the Smithsonian for all the generous volunteers and donors who have supported the project. To date, more than 1,200 individuals have joined corporate, industry, and agency sponsors in supporting the exhibition with more than \$2.3 million in contributions. The Nutrients for Life Foundation of The Fertilizer Institute is the lead sponsor of *Dig It!*, with additional support provided by several USDA agencies, including the NRCS, which loaned its collection of state soil monoliths to the museum for display in the exhibition. SSSA members and NRCS staff have also been generous with their time, act-



A monolith, or vertical slice from topsoil down to subsoil, preserves a soil’s colors and layered horizons in position. Scientists make monoliths of the important soils in their region and use them in teaching. As they pull the board back, they use strips of cloth to secure the soil to the board. Photo by Donald Hurlbert, Smithsonian Institution.

DIG IT!

Soils take center stage at Smithsonian's National Museum of Natural History

SOCIETY & POLICY NEWS





LEFT: Anacostia landfill soil from the 1970s. This touchable model is based on several soil samples taken in the 1970s from the Kenilworth landfill, Washington, DC. The original monoliths are in the collection of the Center for Urban Ecology, National Park Service. In the 1970s, the pit was filled with construction rubble and dirt. Trash was dumped and burned until 1968. Do you recognize any of this stuff? Photo courtesy of the Smithsonian Institution. **RIGHT:** A monolith, or vertical slice from topsoil down to subsoil, preserves a soil's colors and layered horizons in position. Scientists make monoliths of the important soils in their region and use them in teaching. Back at the lab, the soil is "picked" away to leave about 1 or 2 inches of soil with a natural surface and then coated with glue or acrylic floor wax to "fix" it to the board. Photo by Donald Hurlbert, Smithsonian Institution.

ing as members of the SSSA Design Team or the Smithsonian's Extended Advisory Team (visit www.soils.org/smithsonian to view a list of donors, committee members, state liaisons, and supporters of the exhibition).

"SSSA has been a big contributor to the content through the Extended Advisory Team," Megonigal says. "There's no doubt that SSSA members and the knowledge they bring have been important in developing the content, and that's reflected in the exhibit itself. One thing I've come to appreciate about SSSA is that it really does have a very broad swath of scientific expertise, which given the breadth of this exhibit, has been very useful."

The Smithsonian Soils Exhibit Steering Committee provided the overall support, direction, and management of SSSA's contribution to the project. It includes several SSSA members, with co-chairs Megonigal of the Smithsonian; H.H. Cheng, Uni-

versity of Minnesota; Patrick Drohan, Penn State; John Havlin, North Carolina State University; and Kevin McSweeney, University of Wisconsin.

"Early on, we saw that the soils exhibition was an opportunity to educate millions and hopefully inspire many of them to look at soil as an exciting science," says Havlin, former SSSA President. "We will hopefully inspire a future generation of soil scientists."

Bringing Soils to Life

The exhibition brings soils to life and invites visitors to look at them in new and exciting ways through interactive displays, multimedia, hands-on components, and cultural displays. It covers soil concepts ranging from horizon formation to global element cycles. There are three sections on soils from a human perspective, starting at the scale of the planet, moving to a regional landscape, and ending at the home scale. Visitors will learn about

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soils in the context of global cycles, food production, and their own backyard. They will also learn about critical issues of soil management, such as management for forests, food production, and urban development. On a more personal level, the At Home gallery is a delightful and compelling look at the cultural aspects of soils, from their hidden impact on everyday goods and life, to cultural connections around the world such as the Terra Preta soils of the Amazon.

“This exhibit is more ambitious and covers soils with a much broader brush than any attempt that I’m aware of to educate the public about soils,” Megonigal says. “Visitors can expect to get a glimpse of how soils affect them from virtually every conceivable angle.”

Sure crowd favorites include 54 soil monoliths (one from each state, three U.S. territories, and the District of Columbia), arranged to highlight their dramatic color and textural variety; a soils inspection emission station, where visitors learn how soils “breathe”; and *Matters of Life and Death*, an engaging detective story that takes visitors into the who-eats-what world of the soil food web to better understand how soil organisms recycle elements to support ecosystems. Megonigal has his own favorite.

“I love the Chef’s Challenge,” he says. “The idea was to demonstrate how the different soil-forming processes operate as a play off the *Iron Chef* TV show. We have two live actors against a blue screen, which is animated. They’re both given sand as the ‘main ingredient’ and asked to make unique soil recipes. One chef decides to make a spodosol, and the

other chef decides to make a histosol. The actors are very engaging and entertaining, and the animation helps keep people’s attention. This gets across a difficult concept in a way that will engage visitors and actually draw them further into the exhibit.”

The variety of ways in which to communicate complex ideas is one of the advantages of an exhibition, according to Stauffer. It’s more than the script; it’s the environment, colors, illustrations, and photos. But the script is important, and imparting accurate information within a limited amount of space is challenging.

“It’s a constant processing of distilling and refining information,” Stauffer says. “A panel has to be 40 to 50 words ideally, so you have to simplify, simplify, simplify. You also have to figure out how to think of the information in terms of chunks and hierarchies so that people who walk through quickly get the big-level ideas, people who pay more attention to certain sections will get the bulk of the information, and people who are a little more interested can have the opportunity to do some more in-depth reading.”

This process is really a science in itself, or perhaps art, according to Megonigal.

“I’ve come to think of it as a form of poetry in the sense that you’re trying to say a lot with the fewest possible words and images,” he says. “So in terms of content review, part of that refinement is really getting down to the absolute kernel of an idea. You can’t really provide detailed knowledge on any given topic. You have to know what’s important for visitors to understand.”



Knowing this requires careful consideration of visitors’ knowledge levels, which in the case of an exhibition like this, will vary quite a bit.


“It requires a real understanding of your audience, the types of people who are going to come to the exhibit, and layering of content, so that a more informed visitor, who may be a soil scientist or ecologist, can still walk away learning something new or gaining a new perspective on soils,” says Siobhan Starrs, the NMNH project director for *Dig It!*. “But you also need content that is accessible for a five-year old.”

Educating Children, Traveling the Exhibition

Peterson sees the opportunity to educate younger generations about the value of soil as one of the most important aspects of the project.

“I’m really excited about this exhibit because we’re going to have the ability to communicate with kids, and it might even stimulate some towards careers that relate to some aspect of soil science,” he says.

SSSA plans to build on this educational component by publishing a children’s book on soils this month. The target audience of the book will



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be grades 4–6, and it will feature a glossary of soil terms as well as photos of soil profiles, landscapes, and people studying and interacting with soils in everyday life. It will contain figures to illustrate concepts of soil formation and properties, discuss the uses of soil throughout history, and provide personal accounts of individuals who work with and appreciate soil. The book will be available for purchase at www.societystore.org or 608-269-4960 (see page 22 for more information).

The project also includes a web education component. It will be housed on NMNH’s Forces of Change portal website (<http://forces.si.edu/soils/>) and will provide a virtual version of the exhibition, online educational materials, and access to additional resources.

After *Dig It!* closes at the NMNH, a national tour is planned, but major corporate sponsors (as well as individual support) are still needed. The exhibition will be packed up into five semi-trailer trucks and will travel to 10 major natural history and science museums across the country and possibly Canada through 2013. For information about hosting the exhibition at a major museum or science center near you, see www.sites.si.edu/soils. According to Jennifer Bine, project director of the Smithsonian Institution Traveling Exhibition Service (SITES), enthusiasm is already starting to build.

“I had the chance to go to New Orleans to give a presentation about

the exhibition [at the Annual Meetings], and I was absolutely blown away by the level of support that was out there for it and its tour and the number of people who came up to us after the presentation and asked how they could get the exhibition to come to their community,” she says. “SITES is excited to have the opportunity to share *Dig It!* with museums across the country. Its many hands-on features, models, and audio-visual components and correlation with state and national standards of learning make it a valuable addition to the Smithsonian’s outreach efforts.”

SSSA is still looking to raise about \$800,000 to support the traveling tour. For information on contributing, see www.soils.org/smithsonian or contact Development Officer Paul Kamps at 608-268-4975 or pkamps@soils.org. In addition, volunteers are needed to help visitors explore, discover, and interpret the exhibition both in Washington, DC and museums across the country when the exhibition begins the traveling tour. For information about volunteering, visit www.mnh.si.edu/education/volunteer_opportunities/soils.htm. Volunteering is a great way for soil scientists to share their love for soils with others.

“One thing I hope comes through to the public in the exhibit is the intense passion soil scientists have for soils,” Starrs says. “It’s been an amazingly wonderful journey to meet and work with all of these soil scientists and to learn from them about how important soils are to our world.”



TOP: The earth’s “skin” is not one soil, but many soils—each with its own story. Tens of thousands of different soils cover the continents. Art by Matthew Frey/Wood Ronsaville Harlin, Inc. © Smithsonian Institution. ABOVE: Grassland soils are very fertile, in part because they formed under tall prairie grasses with deep, fibrous root systems. Over hundreds of years, the grasses added organic matter to the soils, producing a thick, fertile dark surface layer. Art by Matthew McMullen/Propeller Studio. © Smithsonian Institution.

Exhibition Interactives, Videos, and Models

Find Your Home Earth

A playful postcard interactive where visitors take a trip to visit the soils from 50 states, the District of Columbia, Puerto Rico, Virgin Islands, and Guam.

Chips Off the Old Block

Visitors will get a close-up view of soil parent materials. These will include both primary (those minerals that have not changed chemically since they first crystallized) and secondary minerals (formed when primary minerals dissolve chemically and re-form as new particles).

Texture Matters

Visitors will invert four tumbler tubes to contrast how water moves through sand, silt, clay, and loam.

Size Up This Soil

Visitors study a model profile of three “mystery” soils, from bottom to top, with the aid of text clues and graphic pointers at key features to deduce what kind of environment each soil supports. The answer is revealed when the visitor peers into a “soil periscope” to discover what is at the surface.

Color It Wet or Dry

The color of soils tells a lot about their mineral compositions and how they formed. Six samples of modeled “soils” are part of an exhibit activity in which visitors can use portable color test cards based on the Munsell Color System to match soil samples to color indicators.

The Big Picture

A world map showing the distribution of 12 soil types is the backdrop for three touch-screen stations where visitors will learn the surprising connections between soil and life on our planet.

Skin of the Earth (Entryway)

Animated glimpses of hidden life beneath your feet and natural processes at work.

Chef’s Challenge

Two “Iron Chefs” working in a wacky planetary kitchen create different soils using similar ingredients.

Soil Emissions Station

Soil “breathalyzers” (infrared gas analyzers) detect the carbon dioxide being produced by organisms in two very different soils, with animated data appearing on a screen above.

Life & Death Theater

Life, death, and decay in the who-eats-who world of soils are the subjects of this underground film, edited to the beat of *CSI: Miami*.

Soils: The Secret Ingredient

Medicines, food, fibers, paint, cosmetics, pottery, and wine . . . this video celebrates gifts and pleasures derived from soil.

Get Soil Savvy

We misuse soils at our peril. Explore soil-related catastrophes through dramatic footage of erosion, drought, and mudslides contrasted with the restoration and prevention efforts from around the world.

Hidden Horizons

A touchable, stylized soil monolith reveals the layers of an undisturbed soil column.

Ins and Outs

A dynamic sculptural representation of the cyclical movement of water, nutrients, and gases through soil and the role soil plays in the filtration and flow regulation of water, the storage and cycling of carbon and nitrogen, and as an anchor for plant growth.

Underneath It All

A large topographic and sectional model of a suburban/rural transitional area illustrates the many types and formations of soil found beneath our feet in commercial and residential construction and on roads, dams, and playing fields.

At Home in the World of Soils

Sometimes hidden in plain view, sometimes hard to ignore, soil is all around us and has a profound influence on our daily lives. This model highlights the many roles of soil and the presence of hundreds products made from soils, in a typical house, driveway, and yard.

—SOURCE: Smithsonian Institution Traveling Exhibition Service. See www.sites.si.edu/soils/

