

The “Dig It!” Smithsonian Soils Exhibition: Lessons Learned and Goals for the Future

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The opening of “Dig It!: The Secrets of Soil,” a 5000-ft² exhibit on soil at the Smithsonian National Museum of Natural History in Washington, DC, presented an opportunity to reflect on the development process. The project generated important and new ways of thinking about soils education, and taught the SSSA much about itself and how to manage a project of this size and scope. While early struggles in organization and financing of the exhibit presented challenges never before faced by SSSA at this scale, persistence, flexibility, and some unconventional thinking won out in the end, and SSSA achieved its most significant educational success to date. Most importantly, the process taught many soil scientists that achieving greater visibility for soil science meant partnering with professionals outside of soil science, and trusting that they could convey the message delivered by the exhibit with the same enthusiasm they might have in the classroom. The lessons learned from the project, in the scope of its history, can help others further SSSA, soils education, and soil science as a respected, scientific field. We suggest six goals for the future of soil science that, if embraced with whole-heart dedication and support, can help to embed the importance of soil in world thinking and policy. Our suggested goals are unconventional, like the experiences we faced in creating the exhibit, and thus perhaps will seem beyond the capability of most soil scientists. Hence our reminder: unconventional and bold thinking are what helped create the exhibit and will be what leads SSSA forward as a society best serving the world.

Abbreviations: ASE, Agronomic Science Foundation; NMNH, National Museum of Natural History.

In the dim light of the Smithsonian’s National Museum of Natural History (NMNH), with a background murmur of anticipation, a mother is seen hurrying with her 3-yr-old daughter to see the Hope diamond. Suddenly, the daughter pauses and glimpses colorful murals, twirling columns of soil particles, moving images of worms, and the sound of dripping water; the harried mother follows her daughter into an exhibit on soil. Twenty minutes later they emerge, possibly with an unexpected appreciation for that which is central to their survival on this planet. Seven years of effort by individuals from across the United States and beyond, with collaboration from state, federal, and private entities, has resulted in “Dig It!: The Secrets of Soil,” the 5000-ft² exhibit on soil at the Smithsonian NMNH in Washington, DC (Fig. 1). This is the largest educational project in the history of the SSSA and perhaps in all of soil science. To assist others in educating the public about soil’s importance, we present reflections on the development of “Dig It!,” highlighting lessons learned during the course of its development.

During the project’s 8-yr development, new ways of thinking about soils education have been realized, fundraising strategies developed, and new partnerships fostered to make this fascinating exhibit a reality. What began as a small group of individuals, at times barely able to maintain the momentum for the project, evolved into a large cooperative network of specialists skilled in fundraising, promotion, and translating soil science for the public. Knowledge of how the exhibit development process evolved should be available to help inform future efforts to educate the world about the importance of soil.

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Fig. 1. (A) First exhibit rendering based on discussions from the 2002 Smithsonian Institution exhibit workshop; and 2008 “Dig It!” opening (B) state monoliths display, (C) one of the entrances (note the similarity to the first rendering in A), and (D) soil water movement and particle size display. Photos courtesy of the Smithsonian National Museum of Natural History.

LESSON 1: PERSISTENCE PAYS OFF

In retrospect, one could say that “Dig It!” took >20 yr to create. For both Patrick Drohan and Tom Levermann, cofounders of “Dig It!,” educating society about soil and its importance to our survival was the simple goal. Both men independently approached NMNH in 2001 to suggest developing a soils exhibit because of the museum’s prestige and expertise in science research, exhibit development, and public outreach. Drohan was a recent Ph.D. graduate working at Shepherd College, in Shepherdstown, WV, and Levermann was head of education and publications for the NRCS in Washington, DC. Drohan first visited NMNH in spring 2001, saw an existing, small soils display in the Geology, Gems, and Minerals Hall, and believed more had to be done to communicate the importance of soil. Drohan discussed his visit with West Virginia NRCS soil scientist James “Skip” Bell, who suggested the idea of placing soil monoliths from the Soil Survey Centennial Celebration on the National Mall in the Smithsonian as an exhibit. At Bell’s recommendation, Drohan contacted Jim Ware with the NRCS Soil Survey in Washington, DC, about the availability of the monoliths, and then spoke with Carolyn Margolis, Director of Temporary Exhibits at NMNH. At an initial meeting in July 2001, Margolis, Barbara Stauffer (NMNH exhibit developer), Drohan, Ware, and Tommy Calhoun and Horace Smith of the NRCS discussed the possibility of incorporating soils into other exhibits. In August 2001, Levermann met with Stauffer and Margolis about the possibility of expanding the existing exhibit, adding content about soil to other exhibits, and developing

a traveling exhibit. Margolis and Stauffer quickly concluded that it would be helpful for Drohan and Levermann to join efforts.

This was not the first time SSSA had interacted with the NMNH about a soils exhibit. Unknown to Drohan and Levermann, SSSA had previously worked with the late Smithsonian scientist Jim Luhr to include soils in the refurbished Geology, Gems, and Minerals Hall (the exhibit Drohan originally saw). The SSSA’s efforts for this first exhibit began with E. Moye Rutledge (Univ. of Arkansas), who, as early as 1983, began to express to members of SSSA’s Division S-5 (Pedology) his desire for SSSA to work with the NMNH on creating an exhibit. In 1994, Del Fanning (Univ. of Maryland) was selected by SSSA to chair a committee to develop ideas for a soil science display supporting the Smithsonian Vision 2000 program. Working with the NMNH’s Robert Sullivan, then Associate Director of Public Programs at NMNH (Fig. 2), Fanning’s committee, with Luhr and Stauffer, selected soils and interpretive information for this earlier exhibit.

LESSON 2: FLEXIBILITY ALLOWS QUICK CHANGES

The SSSA Committee Infrastructure Development

A key part of the success of “Dig It!” was the establishment of multiple committees focused on different aspects of the project, and a team of core supporters that spanned multiple 3-yr terms of elected executive officers. Project continuity with key staff was essential for providing experienced leadership familiar with SSSA’s structure and function, and for providing continuity for potential exhibit donors involved in long-term discussions

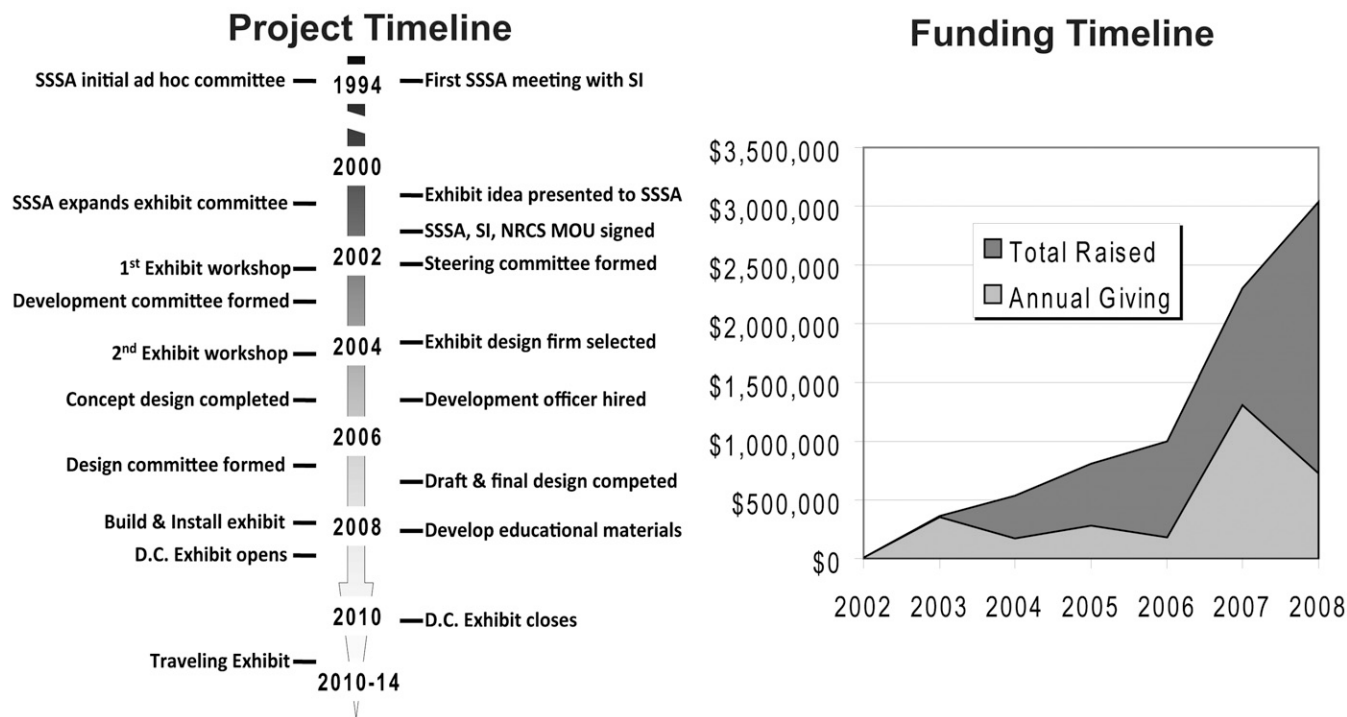


Fig. 2. Soil exhibit and fundraising timeline (SI, Smithsonian Institution; MOU, Memorandum of Understanding).

about exhibit philanthropy. Although the executive officers were instrumental in maintaining momentum and support during their respective terms, several SSSA personnel and members maintained involvement in the project throughout its lifetime, providing needed continuity. It is important to note that no one anticipated the size and complexity of the final exhibit and, thus, no one foresaw what tasks had to be completed or what committees would be needed. Therefore, as needs arose to provide more information on content or support for finding funds, committees were developed around existing SSSA Headquarters staff or the chairs of the exhibit project.

For example, SSSA leaders appointed several special ad hoc committees to manage the Society’s contribution to various phases of fundraising and content development (Table 1). Committee development began quickly after the exhibit was presented to the SSSA Executive Committee at the 2001 Tri-Societies (ASA, CSSA, and SSSA) annual meeting when then-President Robert Luxmoore appointed the S-589 Ad Hoc Smithsonian Soil Exhibit Committee with H.H. Cheng (Univ. of Minnesota) and Patrick Drohan as co-chairs. An important aspect of early success with the project was a draft exhibit memorandum of understanding developed in spring 2002 between the NMNH, SSSA, and the NRCS, which facilitated clear communication, roles, and responsibilities among the three major organizations involved. Also, as the project entered the initial exhibit discussion phase in 2002, the Executive Committee appointed a broader Steering Committee made up of soil scientists from across the United States to provide feedback and review potential exhibit materials (Table 1). As the exhibit grew, fundraising demands grew, too, and in 2003, SSSA President Mike Singer appointed a fund-raising Development Committee to assist Valerie

Breunig, then the Agronomic Science Foundation (ASF) development officer, and the Executive Committee in raising funds for the exhibit (Table 1). Then in 2005, when the exhibit entered into the design phase, the SSSA Executive Committee appointed a Design Committee to review drafts of the exhibit produced by the NMNH team (Table 1). In addition to the SSSA committee structure, the NMNH simultaneously built internal NMNH support for the exhibit by assembling committees internal to the NMNH and composed of exhibit developers and scientists from the Smithsonian Institution, as required by NMNH protocols.

Lastly, the importance of a group of vocal supporters for any cause cannot be underestimated. They work to convince others of an idea’s merit, and offer encouragement and support to sustain the collective effort to complete the project. In the case of “Dig It!,” many individuals during the lifetime of the project, within SSSA, the federal government, and the NMNH, played critical roles generating enthusiasm and attaining support from the broader science community. As will be seen, this group of supporters was also willing to stand up and ask for help when needed. Although the focus on the development of “Dig It!” wavered at times, it remained intact until the end and culminated in a remarkable achievement.

Project Outreach

The final exhibit depended greatly on maintaining project visibility to generate interest and supporting resources, and to provide information to interested parties. Public relations work can be very expensive and in the early years of “Dig It!,” promotional work was constrained by a limited outreach budget derived largely from SSSA’s base budget and funds raised to support the exhibit. Therefore, early outreach techniques to promote

Table 1. Soil exhibit committee structure.

Executive Committee	Steering Committee	Development Committee	Exhibit Development Cooperators	Design Committee
H.H. Cheng, Univ. of Minnesota	H.H. Cheng, Univ. of Minnesota, co-chair	John Havlin, North Carolina State Univ., chair	Kim Berry, NRCS	Patrick Drohan, Pennsylvania State Univ., chair
Patrick Drohan, Pennsylvania State Univ.	Patrick Drohan, Pennsylvania State Univ., co-chair	Surajit De Datta, Virginia Polytechnic Inst. & State Univ.	Julie Best, NRCS	Richard Cline, U.S. Forest Service
John Havlin, North Carolina State Univ.	John Havlin, North Carolina State Univ., co-chair	Nat Dellavalle, Dellavalle Laboratory, Inc.	Pete Biggam, National Park Service	Mary Collins, Univ. of Florida
Kevin McSweeney, Univ. of Wisconsin	Kevin McSweeney, Univ. of Wisconsin, co-chair	Donald Franzmeier, retired, Purdue Univ.	Jon Bricker, Purdue Univ.	Elissa Levine, NASA Goddard Space Flight Center
J. Patrick Megonigal, Smithsonian Environmental Research Center	J. Patrick Megonigal, Smithsonian Environmental Research Center	Eddie Funderburg, The Noble Foundation	Paige Buck, NRCS	J. Patrick Megonigal, Smithsonian Environmental Research Center
	Richard Arnold, retired, NRCS	Maurice Mausbach, retired, NRCS	John Graveel, Purdue Univ.	Laurel Mueller, Soil Services Company, Inc.
	Stanley Buol, North Carolina State Univ.	J. Patrick Megonigal, Smithsonian Environmental Research Center	John Douglas Helms, NRCS	Brian Needelman, Univ. of Maryland
	Richard Cline, U.S. Forest Service	Edward C. Runge, Texas A&M Univ.	Carolyn Margolis, Smithsonian NMNH†	Tom Rice, California Polytechnic State Univ.
	Delvin Fanning, Univ. of Maryland	Raymond Ward, Ward Laboratories Inc.	J. Patrick Megonigal, Smithsonian Environmental Research Center	Susan Southard, NRCS
	Elissa Levine, NASA Goddard Space Flight Center	Richard Weismiller, Univ. of Maryland	Gary Muckel, NRCS	Daniel Walters, Univ. of Nebraska
	Carolyn Margolis, Smithsonian NMNH	William Ypsilantis, Bureau of Land Management	Brian Needelman, Univ. of Maryland	Paul Kamps, ASA-CSSA-SSSA, member ex officio
	Gary Petersen, Penn State Univ.	Paul Kamps, ASA-CSSA-SSSA, member ex officio	Suzanne Pender, NRCS	
	J. Thomas Sims, Univ. of Delaware		Hugo Rogers, USDA-ARS	
	Barbara Stauffer, Smithsonian NMNH		Barbara Stauffer, Smithsonian NMNH	
	Daniel Walters, Univ. of Nebraska		H. Allen Torbert, USDA-ARS	
	James Ware, retired, NRCS		William Ypsilantis, Bureau of Land Management	
	Karl Glasener, ASA-CSSA-SSSA, member ex officio			
	Paul Kamps, ASA-CSSA-SSSA, member ex officio			

† National Museum of Natural History.

the project were a mix of those already used by SSSA and new ones just being adopted; in all cases, volunteers were essential. For example, as “Dig It!” progressed, the Internet evolved and quickly became the primary information outlet. As with many professional organizations, however, SSSA’s understanding of how to effectively use the Internet to promote the exhibit and the Society developed as the technology developed. At first the web site was very simple in design and content, with limited information, but by 2006 it had numerous forms, committee information, fundraising data and donation capabilities, and public relations source material on the exhibit. In addition to the web site, well-established techniques were also used to publicize the exhibit to a broader science community, including NRCS’s soil calendar, SSSA e-mail news flashes to Society members, and

the first exhibit fundraising brochure developed in early 2003. To update Society members on the exhibit’s progress at the annual meetings, various “town hall” discussion sessions were held each year, which often included project leaders at the NMNH or their contractors. “Dig It!” committee members also came up with low-cost and creative ways to promote the exhibit, such as Kamps (2005), other articles in state soil-related agricultural publications, and public speaking events.

As the project entered its fourth year and fundraising slowed, SSSA began several new initiatives to promote the exhibit and invigorate fundraising. For example, in late 2005, Paul Kamps, the newly hired SSSA Development Officer, spearheaded the development of a traveling, exhibit promotion booth to disseminate information and help raise funds. The booth’s design included

floor plan panels showing the exhibit and later a large-format exhibit promotional movie. Although limited somewhat by a small budget for exhibit promotion, the booth nevertheless traveled to Tri-Societies meetings and companion society meetings, such as meetings of the International Union of Soil Sciences, the Ecological Society of America, the Soil and Water Conservation Society, the Geological Society of America, and related local and regional meetings and events. In 2005, SSSA took a significant economic risk with the development of a short, 2-min exhibit promotional video to inspire people about supporting the project. The movie was the most effective promotional piece developed for the project because it successfully incorporated the element of human emotion and tied it to the importance of soil for our survival. While expensive for the Society to produce, it was very important in helping to earn funds for the project when presenting “Dig It!” to major sponsors. Looking back on the overall public relations effort, hindsight would remind us of the old adage “you have to spend money to make money,” a very important lesson for anyone undertaking such a significant outreach effort in the future.

A Name Does Matter

Surprising to many of the soil scientists involved with the project was the complexity of choosing a name for the exhibit. As we were to learn, “branding” the exhibit for the target audience was essential to strengthening the exhibit’s message and enthusiasm for it. Both SSSA and NMNH knew it was important to identify an exhibit title that would resonate with the soil science community and also with the exhibit’s target audience (the sixth- to eighth-grade level). At its inception in early 2001, the exhibit was simply referred to as the Smithsonian Soils Exhibit; however, this name was viewed as too formal and by 2003, the flashier tag line “Soil Sustains Life” was being used with informational inserts in CSA News and on early versions of a fundraising brochure. During the summer of 2005, as the public relations, fundraising, and design work for the exhibit accelerated, several new titles were discussed including: “Soils, Worlds Underfoot,” “Soils, Living Worlds Underfoot,” and “Soils, Life at Your Feet.” Ultimately, “Soils, Worlds Underfoot” was identified as the working title for the project as the exhibit was released for design bid by the NMNH and promoted to large donors. Then, with the approach of the opening, the NMNH began a new survey effort with the Smithsonian Institution Exhibit Travel Service to test market a final title. After input from potential museum venues for the traveling exhibit and the Executive, Design, and External Advisory Committees (Table 1), the NMNH chose the final exhibit title in 2007: “Dig It! The Secrets of Soil.”

LESSON 3: HAVE A SOLID ECONOMIC GAME PLAN TO START WITH Out of Our League at First

From its inception, those involved with “Dig It!” were challenged to quickly learn how to raise funds to meet project costs. Reflecting on the fundraising process, we can identify several areas where SSSA’s inexperience or lack of foresight presented

challenges that could have been better handled. First, fundraising for a project of this size, and doing so within the institutional constraints of an entity like the Smithsonian Institution, was new to SSSA. Before soliciting large donations for the exhibit, the NMNH and SSSA collectively developed funding parameters acceptable to both organizations, which covered donor recognition levels and related benefits, and promotional aspects. As SSSA learned, the exhibit content was the purview of the NMNH regardless of the donor gift amount.

Second, expansion of the project from a display of soil monoliths to a comprehensive soil science education project greatly elevated the project costs. Although the expanded exhibit generated more interest, an understanding of the scope of fundraising needed would have helped accelerate the funding effort. Third, no one involved with the project had experience in raising funds for a project of this magnitude. Although many working on “Dig It!” had experience writing grants for academic research, raising millions of dollars for a museum exhibit was entirely new. For example, early in the project, several hundred written solicitations were made to corporations outlining the project but were not successful in generating financial support. This was probably because personal relationships with a major funding source are often required, which had not been developed. Due to the limited time remaining to complete the project, a generic, “shotgun” funding approach was used. The effort did identify several potential donors for future exhibit or SSSA fundraising efforts with whom relationships could be cultivated, however. In addition, traditional outlets for academic funding proved unsuccessful. For example, SSSA staff worked with project volunteers to submit a grant to the National Science Foundation’s Informal Science Education Program to fund the traveling portion of the exhibit. Although it was reviewed favorably, the proposal was not funded.

Lastly, the project’s dependence on volunteers (Table 1) and an already overstretched Tri-Societies Headquarters staff certainly hindered effective fundraising. For example, early on, Breunig led fundraising efforts while simultaneously fundraising for many other projects under ASF and the Tri-Societies. Thus, a significant dependence developed on volunteer fundraising (Table 1). The Tri-Societies were joined in this effort by volunteers from other groups such as the NRCS, whose staff members Levermann and Ware secured the first large gift for the project in 2002 (a \$50,000 donation from the NRCS to the NMNH) (Fig. 2). Ware shortly thereafter helped secure an additional \$300,000 from NRCS. Project volunteers also played a key role in working with Tri-Society staff to visit federal agencies to promote the project, which successfully opened the door to later agency contacts and resulted in more than \$500,000 in support.

Generating support from the wider body of soil professionals across the United States was viewed as an essential component of the project’s success from its inception. Because part of the goal in publicizing the project was to help raise funds, establishing broad grass-roots support for the project would demonstrate to a potential donor that the project was supported by the soil

science community and, thus, worthy of their financial commitment. To achieve this goal, Breunig and Cheng developed the concept of state liaisons, who would identify potential funding sources while also developing local champions for the project. These private, university, or federal soils professionals might have sufficient knowledge of fundraising possibilities related to soils within their state. Part of the goal of the state liaison was to help raise a fixed sum of \$10,000 per state to support the display of the state soil monolith in the exhibit. Although the state liaison idea was good in concept, managing this many people became very difficult for the limited staff associated with the project. By the time the exhibit opened in 2008, individual and group donations had come from every state, with 33 states reaching the \$10,000 level. The total raised by the states was more than \$513,000.

As important as the exhibit was to soil science, “Dig It!” was important to SSSA as a scientific and professional organization promoting its area of specialization. The SSSA had struggled in the past with focusing on major fundraising priorities driven by society members and fiscal needs, and the exhibit was no exception. By 2004 however it was clear that a more effective strategy for fundraising had to be developed if the exhibit was to be finished. Thus, in May 2004, with only 2 yr remaining, President-Elect John Havlin challenged the SSSA Board of Directors to consider a dedicated, full-time development effort to raise the remaining \$2 million. Subsequently, at the SSSA annual meeting in 2004, the SSSA Board of Directors approved \$100,000 in annual funding dedicated to development of the soil exhibit, which included support for a new development position that was shortly filled by Kamps. As Kamps began his tenure, he organized a number of new fundraising strategies for “Dig It!.” For example, a matching fundraising effort (ASF Matching Challenge Grant) was conducted before and during the 2005 annual meeting, raising \$53,082 for the exhibit. Subsequently, several promotional efforts were initiated to help with fundraising, such as the 2-min promotional video and the exhibit display booth that traveled to numerous scientific meetings. It was during this time that Havlin worked with Kamps on securing The Fertilizer Institute as a \$1 million donor and lead exhibit sponsor. Havlin, Kamps, and the NMNH worked very closely for more than a year to secure this gift, with important contributions from Margolis, Stauffer, and Elizabeth Duggal, Associate Director of the NMNH. Without this gift, the exhibit would not have been possible.

LESSON 4: BE WILLING TO COMPROMISE

How do you educate six million visitors a year about soil in <3 min? While our goal was simple—to educate the nation about soil—achieving this goal in a museum exhibit format meant that significant compromises had to be made. First, the size and scope of an NMNH exhibition like “Dig It!” would be limited by funding. Second, choosing a sixth- to eighth-grade target audience (a substantial visitor demographic for the museum) imposed limits on the depth of coverage for the component topics. In addition, every topic important to soil science could not be included and, therefore, the exhibit content was based on topics most impor-

tant to the target audience. It was essential that selected topics be translated into an exhibit for primarily young people, but also a variety of age groups and visitors who might spend only a few minutes or less on each exhibit display. Meeting these complex objectives was not easy and could not have been accomplished without the close cooperation of the NMNH, SSSA, and MFM Design (Washington, DC). A series of carefully planned meetings set the stage for the eventual success of the project.

The scope of the “Dig It!” exhibit evolved during three initial concept development workshops led by the NMNH. First, the NMNH planned a meeting in March 2002 with NMNH staff and the SSSA Executive Committee to develop initial ideas for the exhibit. Second, NMNH staff planned the first in-depth exhibit workshop and brainstorming session in July 2002 with the Executive and Steering Committees. Third, a Society-wide “town hall” meeting was held at the 2002 annual meeting to solicit broader Society input and support. The March 2002 planning meeting covered a wide range of topics including exhibit design concepts, content possibilities, traveling exhibits, interactive modules, funding, and potential synergistic activity development between SSSA and others. Importantly, it produced a timetable for project completion. Sadly, after this April meeting, Levermann suddenly passed away. His initiative and enthusiasm contributed immensely to the future realization and success of the exhibit.

The July 2002 workshop, which included the SSSA Executive and Exhibit Steering Committees, NMNH soils exhibit project staff, and soils staff from the NRCS, USDA-ARS, the Bureau of Land Management (BLM), and the National Park Service, focused on creating a soils exhibit that was far more comprehensive than initially conceived. The NMNH contracted with an artist to develop a preliminary exhibit sketch (Fig. 1A) generated from the 2002 workshop content ideas, which included a preliminary floor plan.

The next important step for the exhibit occurred in 2004, when a grant from the BLM allowed the Smithsonian to put the exhibit design out to bid. Based on continued success in fundraising (Fig. 2), the NMNH solicited bids for the initial exhibit design later in 2004, and awarded MFM Design the exhibit contract in May 2005. Dr. Patrick Megonigal of the Smithsonian Environmental Research Center in Annapolis, MD, volunteered to work with the project and was appointed to the SSSA Exhibit Steering Committee as co-chair. Simultaneously, the NMNH added Megonigal to the NMNH Exhibition Core Team as Curator. Megonigal’s position was central to the project’s success because he acted as a liaison between SSSA’s later appointed Design Committee and the NMNH Exhibition Core Team, comprised of the exhibit curator and primary NMNH and MFM staff. Megonigal’s close proximity to Washington, his status as an Smithsonian Institution scientist, his long-time membership in SSSA and membership on the SSSA’s S-589 design committee allowed him to communicate with all the parties involved in developing the exhibit’s message and content to deliver the most engaging exhibit possible within budget!

Following the first project design workshop in 2002, the April 2004 workshop was held in Washington, DC, and was at-

tended by more than 30 soils professionals with the SSSA, several soil scientists from the Smithsonian Environmental Research Center, NMNH exhibit staff, scholars from non-science units of the Smithsonian Institution such as the National Museum of American History, and the exhibit design firm, MFM Design. This meeting had a major influence on the main messages of the exhibit and the initial exhibit display ideas. Among the themes identified at this meeting were: soil as life; soil supports organisms; biology and soil processes; food from soil; soil in cultural history; the role of soil in the environment; and careers in soil. These would later play a critical role in focusing the exhibit content. In July 2004, a second meeting was held that was instrumental in identifying the primary exhibit's messages. This session brought to light numerous concepts that many agreed were critical to the public's understanding of the importance of soil in society.

Both of the 2004 meetings conveyed to the exhibit professionals a common understanding shared by the soils professionals in attendance—once the importance of soil is explained, people are typically impressed. The soil professionals at these meetings had much more time, however, to convey this information to the exhibit professionals than a visitor will spend in an exhibit. This is where the expertise of the NMNH and MFM Design was critical. They used various media to deliver the main messages to the target audience within the expected time of an exhibit visit.

The major work on exhibit design began in June 2005 when Laurel Hartley was hired as a summer Content Researcher for the NMNH Exhibition Core Team. Hartley was close to finishing a doctorate in soil ecology and had a background in K–12 education. During the summer, the Core Team developed an exhibit floor plan outlining the themes of each exhibit section, drawing on the workshop reports and the content research provided by Hartley. The floor plan and initial outline were presented to the project's advisors, including the SSSA Design Committee, who reviewed the concept design and the first exhibit scripts in August 2005. Most SSSA Design Committee members had significant educational and outreach experience with soils that contributed to the success of the exhibit, but in the end it was the talents of MFM Design and the NMNH that took the complexity of soil and developed the salient points into an effective and entertaining exhibition.

In 2006, rapid progress began following the gift from The Fertilizer Institute, which made it possible to finalize the exhibition design. The project entered the design development phase and SSSA, the NMNH, and MFM Design worked closely to finalize the exhibit components. Starting with the floor plan and outline, the NMNH Exhibit Core Team developed a series of three increasingly detailed scripts that described the exhibit components and every printed word in the exhibit. The scripts were reviewed by the SSSA Design Committee, internal NMNH committees, and non-SSSA soil science advisors at predefined stages representing 35, 65, and 95% completion. This was an interesting time for several of the SSSA members involved in the project, because in a very real sense, we had to let go of the proj-

ect and let the exhibit experts take over—a task easier said than done. The 95% script was reviewed in December 2007.

Finally, the exhibit opening was scheduled for Saturday, 19 July 2008. At this point, the exhibition entered into Phase 3, the production phase. Exhibit design drawings and graphic layouts were finalized by the NMNH and sent out for bid. Once fabrication and installation contracts were awarded, the NMNH project managers began the difficult work of coordinating contractors, including illustrators, sculptors, model makers, media developers, and many others. This last phase was most demanding on the NMNH Exhibit Core Team, who were still busy writing scripts for the video pieces, auditioning actors, shooting footage, and making decisions on many seemingly small, but important, details of the final exhibit. It was particularly difficult to find high-resolution images of soil profiles and minerals and other specific images because of the demise of film photography and the tendency for scientists to take low-resolution digital images. Soil scientists at the NRCS were a particularly rich and accommodating source of images and information.

LESSON 5: WANT TO MAKE A DIFFERENCE? THINK OUT OF THE BOX

Collaboration with the Smithsonian NMNH presented an extraordinary opportunity and a tremendous challenge to SSSA because the Society had never before undertaken a project of such magnitude. For the first half century of its existence, SSSA was mainly a scientific society providing avenues for meetings and publications for its members and working closely with ASA and CSSA in providing operational support for Society activities. Since the 1980s, in response to membership interest, SSSA's activities have become more prominently focused in the environmental quality and natural resource arenas. By the early 1990s, SSSA began to gain visibility as an independent scientific society with the recognition of soil science as an individual scientific discipline by the International Council of Scientific Unions, the formation of the International Union of Soil Sciences (IUSS), the establishment of the Committee on Soil Science in the U.S. National Academy of Sciences, and increasing participation in broader scientific communities such as the Council of Scientific Society Presidents, the American Association for the Advancement of Science, the Executive Council of the American Geological Institute. The SSSA also became more active in extending its interactions with the geoscience and natural resource communities, expanding its membership and services to practicing soil science professionals, including promotion of certification and licensing of professional soil scientists, and enhancing its education and outreach activities. Thus, when the proposal for supporting a Smithsonian soils exhibit was presented to the SSSA Executive Committee at the 2001 Tri-Societies annual meeting, the officers were enthusiastically in favor of participating in such a project, even though some realized it would require a long-term commitment of effort and resources. In other words, the exhibit seemed to some a natural progression of a scientific society's development that other older and more established scientific bodies had already gone through.

The question then is: What next? We offer some “out-of-the-box” thinking to stimulate action. Although our discussion here is focused on SSSA, we also recognize the importance of strengthening all soil science professional organizations, especially the world’s scientific body for soil science, the IUSS. The goals we present could be adopted by either SSSA or the IUSS. As with “Dig It!,” the question of whether to undertake a project should not be limited by whether funding exists, but certainly in the context of what funds will be needed.

SIX GOALS FOR THE FUTURE OF SOIL SCIENCE

Goal 1: Embrace the Public

Soil science, from this point forward, must involve substantially more outreach that enhances our visibility and ability to educate the public on why soil matters. If there is one key lesson learned from the entire experience of “Dig It!,” it is that successfully communicating with the public requires inspiring the public (Megonigal et al., 2010). It is not enough to teach that soils are important. Producing “Dig It!” has also made it clear that effective communication of soil science to the general public is enhanced by partnering with experts in information delivery and that the message should focus on those most dependent on our expertise—the public.

Soil scientists can do it best, too. The SSSA should become the centralized soil information delivery source and ensure that soil educational material is available for the public. Clear, concise soil information must be easily available to the public; otherwise it will be often ignored, as is typically the present case. The SSSA should partner with information delivery experts to make available the full body of soil knowledge in a digital format, and ideally in an open access environment.

The SSSA must take the lead in K–12 soils education by developing a national soils curriculum (perhaps centered around the new SSSA children’s book “Dig It!”) and by developing mainstream media programming focused on soil. The “Dig It!” children’s book, like the exhibit, naturally lends itself to a curriculum, especially because teachers can take students to the exhibit via the Internet. Many other SSSA books could be used in a similar manner to enhance K–12 education, with specific tailoring to the age group of interest. Developing a national curriculum will be a difficult challenge given the complexity of the U.S. educational system, but it is necessary for soil science to receive greater visibility at the K–16 level. The SSSA has pursued this task somewhat with the K–12 Committee and must now push forward to complete the task. A national curriculum and increased visibility in the public eye will make more students aware of soil-related careers and possibly prompt more guidance counselors to suggest such careers.

Goal 2: Branding

As Levis is to jeans, SSSA must be to soil science. We cannot be shy about it either. Turn on any television education channel across the globe and you will be hard pressed to find anything specifically about soil. You will see certain science fields repeatedly highlighted however; fields that have spent significant sums of money to make sure their scientific message is translated for the general public in a way that generates interest and indirect

support. What this comes down to is branding soil science—dealing with the identity issue soil science still faces (Hartemink, 2006, p. 160-165; Lal, 2007). The impressive organization and outreach efforts of scientific organizations like the Geological Society of America and the American Geophysical Union are a reality because of funding and out-of-the-box thinking on how to promote their science. We must be just as bold in how we demonstrate to the world that soil matters.

Goal 3: Greatly Expand the Political Presence of Soil Science

The ASA–CSSA–SSSA Science Policy Office staff based in Washington, DC, could be expanded to allow the development of new programs, including having scientists rotate into the office for 3- to 6-mo periods to assist in specific or general promotion of soil science. The Science Policy Office has made tremendous strides in moving soil science to the forefront of many political venues via development and support of the Director of Science Policy position in Washington, DC, the Congressional Soils Caucus, the Congressional Day Visits Program, and the distribution of electronic Science Policy Updates to Society members. The progress made by the Science Policy Office has been one of the shining beacons of the Tri-Societies in the last 5 yr. Based on the success we have seen with this office, and the impact on soils education, it seems logical that more dollars and personnel hours be focused on Washington to enhance the political visibility of soil science.

Goal 4: New Partners Mean a Thriving SSSA and More Soil Science Education

As the Geological Society of America (GSA) has not wedded itself to the USGS, so must SSSA be cautious as a scientific body of relying heavily on the USDA, especially with the current downsizing of the USDA. In the 1970s, the federal government was the largest employer of soil scientists, but today, in many regions of the United States especially, private sector soil scientists far outnumber federal soil scientists. The SSSA has been slow to respond to this changing demographic, perhaps in part because we are a scientific society trying to maintain our voice in the academic realm. Given the discovery of soils by the American Geophysical Union (AGU), the GSA, and the Ecological Society of America, however, and the ensuing competition to attract members (often of all four organizations) to present soil-related findings, SSSA is faced with a difficult decision on how to maintain a competitive voice in the nation’s science, a voice in the past largely tied to the federal government soil scientist and the land grant university. If SSSA is to survive, it must be as aggressive a marketer of soil science as AGU and GSA, recruit more soil scientists from the geosciences and ecological sciences, position its scientists within key federal funding agencies, and be unabashed about demonstrating that they represent not only the academic soil scientists but also the greater thousands of professional, private soil scientists. The SSSA must also adapt meetings and support activities to be much more encompassing of soil science professionals from a variety of disciplines and fields, but in

doing so not sacrifice the science. One way to effectively do this is to divest its interests from the ASA and CSSA.

Goal 5: Rethink Soil Information Delivery

Modern information delivery techniques, coupled with simple presentations of material, must become the norm in soil information delivery and education, especially with Soil Taxonomy (Soil Survey Staff, 1999). Some could effectively argue that in the last 20 yr, the detail of Soil Taxonomy, and the information one needs to classify soil, has moved beyond the knowledge of non-soil scientists and even most soil scientists working outside of pedology (let's put aside the costs of characterizing a profile, too). This must change or Soil Taxonomy will certainly go the way of most extinct languages. How do we do this? Move Soil Taxonomy to a three-dimensional, digital, high-definition format, world-wide web interface that is landscape based in its presentation. A user, with no knowledge of soil, should be able to use a graphical user interface to select a landscape anywhere in the world via Google Earth, zoom into a pedon position on that landscape (Beaudette and O'Geen, 2009), and for each instance (pedon position), see an example pedon, and be taught what they are seeing (using Soil Taxonomy and generic language) and how the soil and landscape influences land use. A pedologist can do this by reading a soil classification, and they can explain it to an audience when needed, but there are only a handful of pedologists left in the world. Our doomsday clock has nearly stopped, but we have a last chance as long as we effectively demonstrate the value of Soil Taxonomy and educate users on how to use Soil Taxonomy without it being a hazing ritual.

The SSSA should partner with outreach professionals nationwide, such as Cooperative Extension, and globally deliver peer-reviewed, applied soil information. The SSSA can take a stronger leadership role in conveying soil information by developing worldwide "prescriptions" for soil management targeted to key developing countries and problems. The development of guidelines for managing food and human health related soil problems will help millions of people. Such a role for SSSA could evolve into a rapid-response soils-aid team that would assist others in need and in demonstrating the importance of soil. The SSSA could support a team through existing national or international organizations or perhaps even develop their own team of experts.

The SSSA should develop and support specific soil science education and training initiatives through programs such as Teach for America, the Peace Corps, and the United Nations. The more individuals who are aware of the importance of soil the better off all will be and the more likely that we will find young people wishing to pursue careers in soil science. This opportunity would also increase the likelihood of soils knowledge reaching many more people.

Goal 6: The SSSA Should Develop the World's Leading Think Tank on Soil

The SSSA should develop a soils "think tank" made up of individuals from a variety of fields (not just soil science) who work

together to map out potential soil problems and opportunities that lie ahead and who reexamine past problems and their solutions. Providing soils education to scientific colleagues and policy experts will be a critical role for SSSA to fulfill in the coming years. Whether the issue is food production, nutrient management, or human health, soil will play a central role in the survival of our species in the coming century(s). The growing recognition of SSSA as a leader in soil science, coupled with the world's scientific bodies recognizing the importance of soil science, means that SSSA will be strongly positioned to be the authoritative expert to help educate, formulate policy, and guide soil-related research.

CONCLUSIONS

We believe that "Dig It!" is potentially the dawning of a new era for soil science and SSSA. The increased interest in soil across multiple disciplines means more are practicing soil science, conducting research related to soils, teaching others about soil, and learning about soil. Not all in an educational or research role are traditionally trained soil scientists either, but they are generating interest in soil. Whether this is good or bad remains to be seen. As the nation's scientific body of soil scientists helping to protect one of the most important natural resources on the planet, we have to have a loud, proactive voice in every realm of soil knowledge and its communication. While we have struggled at times in the past to do this, the development of "Dig It!" has helped transform SSSA by showing its members how a scientific society can actively engage in public education, and the value of doing so. Perhaps it was the right time for "Dig It!" to come along, or perhaps any other project of this size would have succeeded, given the right momentum, simply because SSSA had reached the point where it was ready to address a project of the magnitude of "Dig It!." While initial inexperience in shepherding a project as large as "Dig It!" resulted in short term set-backs in planning and meeting fundraising goals for the exhibit, SSSA learned that carefully planned risks with the support of outside experts can have substantial payoffs. The end result is a much stronger scientific society, better prepared to lead. What will you do next, SSSA?

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