

Administrative Information

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Project Summary

CHALLENGES ADDRESSED

How we interact with and learn about nature has changed dramatically in the last half century. Pergams and Zaradic (2008) used multiple metrics to document a “fundamental and pervasive shift away from nature-based recreation.” For instance, per capita visits to US national parks have steadily declined over the past two decades (Pergams et al., 2004). These and similar patterns have led some authors to coin terms such as “videophilia” (Pergams and Zaradic 2004) and “nature deficit disorder” (Louv 2005) to describe the trend and its perceived impact on how humans relate to their environment. Thus, nature-related museum and science centers are **faced with new challenges in relaying natural sciences content to an audience that is increasingly distanced from nature.**

Simultaneously, digitization initiatives at a national (e.g., [IMLS](#), [NSF](#), etc.) and international level (e.g., [GBIF](#), [BHL](#), etc.) have resulted in an unprecedented amount of digital collection data. The Global Biodiversity Information Facility alone aggregates over 383 **million** specimen records! Although digitization and the internet can make data available to the public, many data portals appear to be made by scientists for scientists. While there is a great deal of digitization still to be done, we believe that **the emerging challenge is the creation of user friendly tools** and interfaces that allow the public to interact with these data in ways that are relevant to them.

In response to these challenges, the San Diego Natural History Museum (SDNHM) has begun development of a social software learning community that facilitates deeper levels of engagement into the natural sciences along a path determined by the individual learner. Taking advantage of the boon of collections digitization and a cultural shift to “videophilia,” we seek to reconnect the general public with nature by creating engaging tools for learners. Although seemingly oxymoronic, several recent studies indicate that technology can be a gateway to nature for youth (Chavez 2009) and adults (Schneider et al. 2011). To be successful, such an online community must be based on existing strengths of content, identified interest groups, and be focused narrowly enough to develop and test the software platform and architecture.

This community, *NatureSpace*, builds on existing strengths at SDNHM including, 1) existing digitized natural history data from multiple taxa, 2) proven flagship projects in citizen science-driven research projects (e.g., [Bird Atlas](#) [Plant Atlas](#)), 3) developed relationships with regional organizations committed to learning and teaching about the region’s natural heritage, and 4) an institutional history of informal science education. Our focus is based on the wealth of

content found in databases for the 8 million specimens of the SDNHM research collections developed over 100 years in our museum's mission region: southern California ranging from Point Conception near Santa Barbara, south to the tip of the Baja Peninsula in Mexico. The content is continuously enhanced by research projects, many of which are supported extensively by citizen science volunteers.

Initially, *NatureSpace* will be rich in content directed towards residents and visitors of San Diego County, but will be a model for similar initiatives at multiple scales by any organization with location-based collections data. That said, San Diego is an ideal launching area for this initiative. It is the sixth most populous county in the nation with 3,098,269 people (SANDAG 2008 and Census 2007) and already supports a number of networks that are geographically focused with a demonstrated interest in developing content for the social network. These NatureGroups exist in the form of citizen-based land conservancies, friends groups, nature-related docents, and taxon-based interest groups. In addition to these external groups, the SDNHM already boasts several museum-based volunteer groups who support our citizen science projects, deliver educational programming for outreach, and lead field trips in regional parks.

PROJECT AUDIENCE & BENEFITS

Natural history interpretation should be accessible to users of various ages, ethnicities, and socioeconomic backgrounds, and while *NatureSpace* has the potential to reach such a demographically diverse audience, the primary audience during initial development will be focused on San Diego County, the SDNHM audience and existing NatureGroups.

San Diego County is roughly half the size of the State of New Jersey and is home to the second largest state park in the continental United States, Anza Borrego Desert State Park. The county is considered to be the most floristically diverse county in the United States with 2143 species of vascular plants (Simpson and Rebman 2004). It stretches from the ocean to the desert and is home to many endemic species and rare habitats. In 2008, *Forbes* magazine declared San Diego to be the #2 city in America for the outdoors and the city has the highest percentage of parkland (21.5%) of any city covered in their analysis (Ruiz 2008). A love of outdoor recreation is deeply rooted in San Diego County and three of the top ten visited state parks in California are found in the county (CA State Parks 2008).

The population of San Diego County is 48% non-white and almost 30% Hispanic, giving SDNHM projects an opportunity to maximize participation by underserved audiences in STEM learning experiences. Existing SDNHM educational programs do, in fact, primarily serve minorities (e.g., School in the Park serves 83% Hispanic or Latino children). Museum visitors are roughly 65% local residents and 35% tourists to the region. SDNHM currently has 596 regular, active volunteers and over 600 specially trained parobotanists, volunteers who make voucher-based plant collections throughout San Diego County. A recent survey of SDNHM volunteers found that the population is slightly skewed towards females (60%), older (75% over 55), and well-educated (about 85% college graduates or post-graduates). Demographics of NatureGroups vary but most often they are composed of 30-70 year old men and women with some college education.

The audience already participates regularly in informal online nature-related social networks. Existing networks range from Usenet newsgroups for bird watching, to more content-rich networks like Bug Guide (www.bugguide.net), and discipline (e.g., birds, plants, etc.) or place-specific (e.g., Anza-Borrego Desert State Park) nature-related Flickr photo-sharing groups.

These groups are moderated by list members and host discussions ranging from assistance in identification of species in photographs to observations of behavior. A recent survey of 9000 members of SDNHM found that 70% of members spend greater than five hours on the internet per week and 44% spend greater than 10 hours per week. These same members are specifically interested in “news on collections and research at the SDNHM.”

Users will benefit from *NatureSpace* by the ease of accessibility to content previously not accessible, and a collaborative learning environment that encourages deeper levels of exploration and discovery. Groups with a targeted interest will have access to and be able to shape content in a way that provides a personalized discovery path for their members. This personalization of content can strengthen the affinity members have for their space, and increase appreciation of the complexity of the natural environment.

Process & Project Results

INTRODUCTION TO SPARKS! NATURESPACE

The goal of this IMLS *Sparks!* funding was to develop a prototype tool that consolidated and served natural history collection data to NatureGroups for development of custom content for the areas they serve. In particular, we sought to serve three different NatureGroups serving three heavily visited natural areas in San Diego (See map in Figure 1). This proof of concept will provide a test bed for created content and a delivery application that will undergo intensive evaluation with the ultimate end-user, the general public. Below we: 1) outline the trials and tribulations of the project, 2) provide literature from outside the field for patterns we encountered, 3) describe the current state of affairs (as of December 2014), and 4) provide alternatives moving forward.

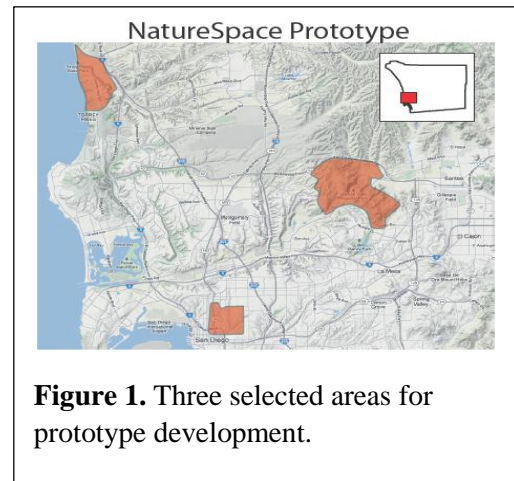


Figure 1. Three selected areas for prototype development.

A TALE OF MANY STAKEHOLDERS

One of the greatest hurdles for *NatureSpace* is to develop tools that meet the requirements of all the stakeholder groups involved. Very broadly, *NatureSpace* has three main stakeholder groups: 1) Science Content Creators, 2) Content Storytellers, and 3) Content Consumers.

Stakeholder: Science Content Creators

Background ~ For the purpose of the *NatureSpace* prototype, Science Content Creators were limited to the curators and data managers of the non-fossilized collections at the San Diego Natural History Museum (i.e., Herpetology, Entomology, Botany, Birds & Mammals). Additionally, this group included one Digital Content Developer hired on the *Sparks!* grant to liaise with SDNHM scientists to identify candidate species lists, assemble media, and create species accounts. Prior to submission of the initial grant, these stakeholders were assembled and

we discussed the overall purpose and long range goal of *NatureSpace*. Collectively we identified one major challenge.

Greatest Challenge ~ Collections in most major natural history museums have traditionally been in silos by discipline. Historically, collection digitalization has operated completely independently between disciplines with standardization being dependent on the curator and discipline-specific initiatives (e.g., HerpNet, etc.). Overcoming the differences in metadata structure is the single greatest challenge in unifying Science Content Stakeholders for *NatureSpace*.

Potential Solutions ~ There are two ends to the spectrum of potential solutions to this challenge. At one end, we develop discipline-specific applications that periodically format and export data for importation into *NatureSpace*. At the other end, we create or adopt “One ring to rule them all,” and force all collections to use the same collection database which becomes the engine for specimen data in *NatureSpace*. For the purposes of this proof of concept, we adopted the modified version of the first alternative. We requested data exports for the discipline-specific databases, reformatted them to be consistent, and then imported them into *NatureSpace*. This would be a fine and cost effective solution for small collections that are relatively static in new acquisitions. However, for large collections that are actively growing, this is not the long-term solution. It is our long-term goal to transfer all of our collections to Specify (<http://specifyx.specifysoftware.org/>) and use this as the engine for *NatureSpace* collection data. Our Herpetology Department is currently using Specify APIs with great success to feed content into their Amphibian and Reptile Atlas that was funded by IMLS grant MA-04-12-0379-12 (see more at <http://sdnat.org/herpatlas>). The Entomology Department has likewise transferred over to Specify and our Paleontology Collection received funding in 2015, via IMLS grant MA-30-15-0281-15, to make the transition. We are currently working with our Botany and Birds & Mammals collections to assist in a transition to this common platform as well.

Stakeholder: Content Storytellers

Background ~ For this prototype, we identified three local NatureGroups (The Mission Trails Trail Guides, Torrey Pines Docents, and SDNHM Canyoneers) to represent this large group of stakeholders. To engage this group in the development of *NatureSpace*, we worked with the Balboa Park Online Collaborative to collect “user stories” from all three groups. User Stories are a short description of a feature told by the person who desires the new capability. We used the following template as a prompt during stakeholder meetings: “As a <type of user>, I want <some goal> so that <some reason>.” This process generated 50+ user stories that the project team categorized in three different priorities based on frequency of request and discussion with groups following the creation of User Stories. The three priority areas were, 1) must do as part of prototype, 2) good if we have the time, and 3) consider for full implementation in the future.

Greatest Challenge ~ Interestingly, the greatest challenge for this group of stakeholders was psychological. On two occasions while presenting to NatureGroups, someone was heard to comment, “If they do this, then what will we do?” It is important to remember that these stakeholders are trail guides and docents that host guided walks in their respective areas. What we encountered was not unlike the folk story of John Henry and the steam-powered hammer. In our case, some docents were concerned that the technology would make them obsolete. Another challenge that we encountered with this stakeholder group was some apathy to be Content

Storytellers. Many expressed interest in being Content Consumers, but few felt like they were technologically “savvy” enough to be Content Storytellers.

Potential Solutions ~ Through the “user story” process with stakeholders and further discussion with leaders among the NatureGroups, we found a link between the concern of obsolescence and the apathy of being a Content Storyteller. In general, people who already consider themselves to be “technophiles” were eager to work in developing content and were not worried about obsolescence. Based on this, the project team contacted the other potential NatureGroup and specifically requested volunteers with experience with digital photography, GPS, and smart phones. We then worked with self-identified technophiles as opposed to a broad spectrum approach.

In retrospect our findings and solutions are consistent with research on the development of social networks. Much like offline social networks, not all participants in online networks participate to the same degree. In an analysis of two online social networks (Flickr and Yahoo! 360), researchers suggest that social networks are composed of passive users, inviters, and linkers (Kumar et al. 2006). Linkers are the primary content developers but are also heavily involved in creating social connections. Inviters desire to bring offline networks online and invite new members who may become passive consumers or extend the network by becoming inviters or linkers. Kumar et al. (2006) found that linkers make up 47% of Flickr networks, with inviters and passive users making up 33% and 20%, respectively. A separate survey of 4384 broadband users found roughly similar proportions with 28% of users classified as “social networkers,” 48% “contributors,” and 24% “non-contributors” (Netpop Research, 2008). The clear lesson here was to specifically target recruitment to self-identified “technophiles” in our NatureGroups. Moving forward, we are eager to track sustained interest and patterns of recruitment to for Storytellers. Ultimately we envision developing a robust social platform that rewards Storytellers for quality and quantity of created content (i.e., much like Yelp and Trip Advisor).

Stakeholder: Content Consumers

Background ~ The ultimate audience of *NatureSpace* is the general public interested in engaging in the outdoors and biodiversity knowledge. It was beyond the scope of this prototype to conduct rigorous stakeholder surveys and evaluation. As a stop gap to keep the final user in mind, SDNHM/BPOC staff and representatives of several NatureGroups created “user stories” from the perspective of Content Consumers.

Challenge and Solution ~ Clearly, the above approach creates a biased and weak sampling of the true potential audience. This was a “planned challenge” outside of the scope of the project. In fact, the intention of this grant was to develop an initial proof of concept for user testing and evaluation. After Content Storytellers have further time to develop trails, we plan to conduct end-user testing in late 2015. This evaluation will feed into development of a full implementation of *NatureSpace*.

STAFF TURNOVER AND CONTRIBUTED CODING

Very broadly, this IMLS *Sparks!* award had two major components to deliver. The first component was to assemble museum content for three defined geographic areas in San Diego County (Figure 1). The second was to develop a web-based tool for Content Storytellers to be able to “mash-up” museum content into guided trail for delivery to the general public. Due to considerable turnover at both the executive management and project management level at BPOC

in 2014, the technological development of the project did not get consistent dedicated time until June of 2014. While this resulted in project delays and frameshifts of deliverables, BPOC ultimately dedicated considerable talent and resources, **including over \$11,000** of in-kind coding, in order to deliver a functioning prototype.

DEVELOPING CONTENT, CONTENT DEVELOPERS, AND TECHNOLOGY IN A FLUID SCIENCE

Synonymy Tsunami ~ A notable challenge for scientists working with application and content developers is the fluid nature of taxonomy (i.e., the science of organismal classification) and inconsistent adoption of name changes. Particularly problematic are cases of synonymy in which formerly “established” scientific names are changed based on the best available science and adherence to the well-defined Zoological Code Nomenclature. For optimal database interoperability, the same collection objects need some manner of identification that links them between systems. For a physical collection object, this is accomplished by the creation of a unique identifier number or catalog number. Where a work of art typically has a well-established creator and title, a specimen has a taxonomic identity assigned which may or may not be correct and furthermore may change because of reclassification in the future. Sound complicated? It is, even for experts in the field. Imagine how an application programmer or content developer whose last exposure to Linnaean taxonomy occurred in high school might feel. Developers of natural history collections databases and information standards have long considered and solved these issues within their own systems. As we try to develop tools for the general public to integrate diverse natural history data sources and contribute to them, methods to link varying taxonomic hypotheses with these tools is extremely relevant to the application developers working on these projects. SDNHM has found through three separate online projects that that fluid state of taxonomy is the single greatest learning curve for application developers. We highly encourage colleagues to strongly consider an “onboarding” procedure to quickly bring developers “up to speed” with the challenges and potential solutions.

Developing Content Developers and Expectations ~ An interesting challenge for this project was the development and implementation of a narrative voice for “SDNHM Curated Content” for *NatureSpace*. In this prototype of *NatureSpace*, we uploaded “SDNHM Curated Content” for 191 common and interesting species known to occur in the three NatureGroup areas. This curated content includes: georeferenced specimen data in San Diego County, taxonomy, confirmed photo/audio/video media, generalized narrative distributional information, and a concise natural history summary of no greater than 60 words. Most of the above is relatively free of style and voice. However, we had some debate about the voice of the natural history summary. There was some push by our content developer to use a more poetic and loose voice. Ultimately we choose to a “standard” science voice that matches that of SDNHM labels. The ultimate result was text that scores a 9.5 on the Flesch–Kincaid Grade Readability Scale. To date, our science advisors are content with the accuracy of the text. That said, we are concerned about the end-user expectations and look forward to further evaluation with the general public.

WHERE DO WE GO NOW?

This project initiated an organizational-wide conversation about digital strategy. SDNHM is currently undergoing strategic planning and identified a gap in the lack of a digital strategy. Combined with IMLS grant MA-04-12-0379-12, this *Sparks!* grant has functioned as a “Good Housekeeping Seal of Approval” for further development of digital initiatives at SDNHM. While

the prototype still requires testing by the ultimate project audience, we could not be more pleased with the current outcome. This *Sparks!* grant has been the catalyst to unite previously “siloeed” citizen scientist projects at SDNHM. While it will take considerable resources to realize a fully operational social networking *NatureSpace*, we feel that we have a functional proof of concept for further user testing and evaluation.

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