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# iCAVERNS: INTERPRETATION, THERE'S AN APP FOR THAT!

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## **Abstract**

A quarter of a century ago, cave and karst resources were declared irreplaceable with the passing of the Federal Cave Resources Protection Act. Yet, today, few understand the importance or fragility of these resources. Human interactions in karst areas make these resources highly susceptible to damage. Nonpersonal interpretation digital media products could serve as an important tool to bridge this informational gap.

Worldwide, there are hundreds of parks or park-like attractions focusing on cave, spring, or sinkhole resources. Their visitors have a built-in curiosity about these places. Engaging this audience in interpretive programming could greatly increase their speleological knowledge. Paradoxically, the same attractions without accurate interpretive materials can also be responsible for promulgating cave and karst misconceptions. Digital media can be very effective tools for increasing awareness and stewardship of cave and karst resources.

Smart device applications (apps) present several advantages over traditional interpretation media

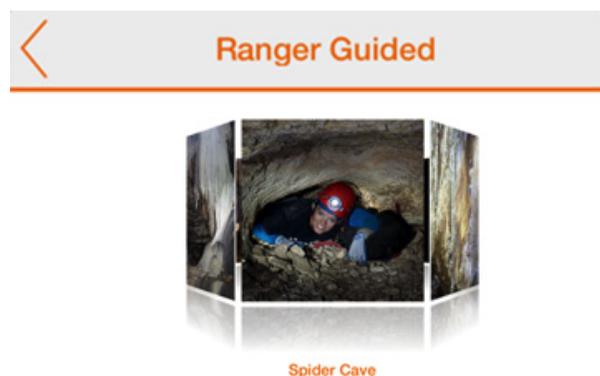
including, engaging audiences outside of the attraction's boundaries, presenting interpretational messages to visitors in their native language, and maintaining content integrity. However, video and photography methods in cave environments present many challenges. Filming crews and gear requirements can cause irreparable damage to caves. This paper discusses the development of the iCaverns app, which was developed utilizing new green film making techniques as an educational and travel guide for Carlsbad Caverns National Park.

iCaverns enhances visitor experience by interpreting geologic resources at Carlsbad Caverns National Park. This app could also make park resources come to life, for more than 400 million people, in 155 countries and 38 languages.

## **Introduction**

Twenty-five years ago, the United States Congress declared cave and karst resources as invaluable and irreplaceable parts of the Nation's natural heritage. Recognizing that urban spread, increased recreational demand, improper use, and a lack of statutory protection pose threats to cave resources, these leaders passed the Federal Cave Resources Protection Act of 1988. One purpose of this act calls for the securement, protection and preservation of caves for the benefit of all people to use and enjoy in perpetuity (16 U.S.C. § 16).

This purpose provides complex management challenges: preserving a resource while making it available for recreation. Perhaps the authors of this law gleaned from the wisdom of great naturalists like John Muir, Enos Mills, and Freeman Tilden to develop this seemingly paradoxical purpose. The work and accomplishments of these early conservationists illustrate the idea that one's



**Figure 1.** Screenshot of the iCaverns app user interface.

experience with nature influences them to conserve and protect it. John Muir is arguably the most important spokesperson for the conservation movement during the 1800's and he is remembered for his help founding the Sierra Club, as well as his role in the establishment of Yosemite National Park. Muir wrote, "I will interpret the rocks, learn the language of the flood, storm and tea valance. I'll acquaint myself with the glaciers and wild gardens, and get as near the heart of the world as I can" (Browning, 1998). Muir demonstrated the amazing power interpretation has to help people understand and care about the natural world.

Communication is the key in solving the perceived contradiction between land use and protection. As a planning directive, the Federal Cave Resources Protection Act calls for the Secretary to foster communication between land managers, those who utilize caves, and the public (16 U.S.C. § 16).

The first modern writer to identify an interpreter as someone who translates what is seen and experienced to others with less experience was Enos Mills (Brochu and Merriman, 2008). The National Association for Interpretation defines interpretation as "a mission-based communication process that forges emotional and intellectual connections between the interest of the audience and the meanings inherent in the resource."

Interpretation is generally broken down into two categories: personal- presented directly by a person and nonpersonal- media such as publications, signs, or products deliver the message. Interpretation is an effective communication tool for land managers because sound land management requires cooperation and input from all types of people including the general public. People have difficulty protecting something they do not understand (Guo and Jiang, 2011). Though the notion to increase the general public's understanding of caves and karst is widely accepted throughout the cave and karst community, there are very few examples in the literature identifying common misconceptions or effective instructional methodologies. However, there is an extensive body of knowledge within the realm of interpretation.

Utilizing effective interpretive methodologies, the iCaverns app is a nonpersonal interpretive tool serving as a travel guide for the natural resources at Carlsbad Caverns National Park and World Heritage Site. The main

interpretive goals for iCaverns are to inform users about the speleogenesis, unique environments, and the impacts humans are having on the cave and karst resources inside this National Park. This app gives access to these resources through video and photographic images.

## Cave and Karst Interpretation Trends

The exotic but beautiful appearance of karst landscapes, as well as the thrill of exploration and discovery draws millions of visitors to these features around the globe. The assumption is made that visitors to cave or karst-focused attractions have an interest in the resource. This built in interest primes the audience, making them more open and eager to learn about cave and karst resources. Therefore, cave and karst focused attractions are excellent venues to deliver cave and karst interpretation and education (North, 2011).

Indeed many of the cave or karst focused attractions have both personal and nonpersonal interpretive programs. Unfortunately, some of these programs have been responsible for passing forward misinformation about cave and/or karst resources (Kastning and Kastning,



**Figure 2.** iCaverns app photo sample of the Left Hand Tunnel tour.

1999; North, 2011). This same paradox exists when developing products like digital interpretive media. People purchasing cave or karst-centered media have an assumed interest in the subject. Because media products typically have a long shelf life, it is increasingly important to ensure the content is correct and in agreement with accepted scientific theories. Developing cave or karst focused for joint media engagement, like smart device apps would provide an effective interpretive experience for the whole family (Takeuchi and Stevens, 2011).

There are several advantages smart device apps have in comparison to traditional interpretation. Smart device apps engage the younger “plugged-in” generation as well as older generations. Apps bridge the generation gap, because they give generations the opportunity to experience them together. Apps virtually put the resource in the pockets and hands of those interested in it, whereas traditional interpretation requires an onsite visit. Lastly, app development teams have a higher level of control over the content. Both the developer as well as the end-user can easily update apps, making content maintenance somewhat effortless and seamless.

### Conceptual Phase

The iCaverns project was born from the developer, Michael Hernandez, conceiving the notion to put Carlsbad Cavern into people’s hands. The major conceptual theme for iCaverns is developing a comprehensive guide of Carlsbad Caverns National Park, which will entertain and educate visitors. This app is intended to enhance visitor experience and also to provide virtual experiences for people that do not have the ability or means to visit the park.

Users will have multiple choices available to move through the app. There is information provided about the town of Carlsbad, New Mexico as well as general information about Carlsbad Caverns National Park. The app includes an educational area, various animations, and nine virtual “ranger” guided tours.

iCaverns is targeted for Apple’s smart device market, which reaches more than 450 million people in 155 countries / 38 Languages. The app will also be developed for Android devices; however, the two users vary greatly in expectations.

### Development Phase

The major themes driving the design and development for the iCaverns app are information that is high quality, authentic, and engaging. All pieces for this application have been developed applying these qualities.

### User Interface

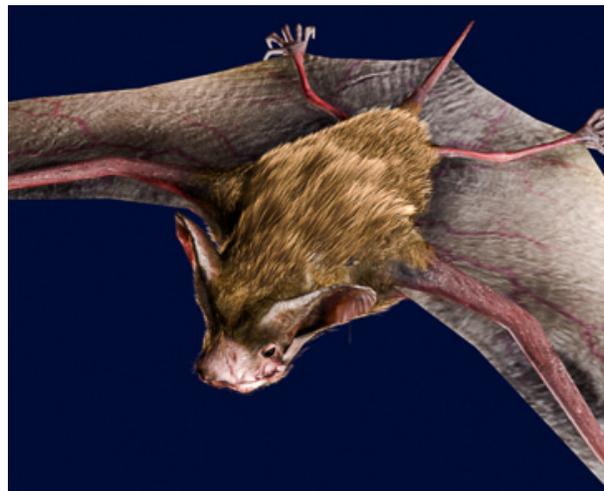
Hernandez developed the user interface integrating the project design principals and usability data. The resulting interface is engaging and beautiful, yet it is simple to navigate. This was accomplished by keeping the interface design uncluttered.

The users can navigate away from the main screen by dialing up the portion of the app they would like to visit. Each sub-interface also carries the simple and uncluttered look. The interface for the cave tours is a replica of cave maps, so users will know where they are in relation to the item being discussed.

### Animations

There are multiple animations on the iCaverns app, including one for modeling speleothem development and another modeling a Mexican Free-tailed bat in flight (Figure 3).

The animations were developed using Pixar Studios. While the methods are proprietary, one of the designs did include input from bat specialists, as well as the use of video and photographs to build the bat within the app with a high level of authenticity and quality. Users can view every angle of the bat and observe muscle movement during flight.



**Figure 3.** Bat animation screen shot.

## Video Guided Tours

The “guided” tours section of the iCaverns app is patterned after the tours offered at Carlsbad Caverns National Park. Dianne Joop, a cave education and interpretation specialist and Mark Joop, a geologist and cave interpretation specialist, co-developed each of the nine tours around a central theme. With nearly five hours of video, the virtual ranger, Mark Joop, guides users through topics including the geologic setting, speleogenesis, cave biota, historic uses, human impacts, and various historical figures of the park.

Capturing high quality video in low-light situations is challenging, yet does not compare to capturing video in no-light settings. Cave environments are especially fragile and can be impossible to repair. Capturing the cave through video and photographs without damaging the environment was extremely important to the production crew. The iCaverns’ Director, Dianne Joop, developed green film making guidelines, specific for cave environments. Green film making aims to make the film making process more sustainable by leaving as little environmental impact on the planet as possible while producing your project. Joop’s production methods reduced impact on the cave environment by reducing crew size to two to four persons carrying minimal and necessary gear. The crew also lowered consumption by carrying reusable water bottles, using rechargeable batteries, and carpooling to shooting locations.

The iCaverns’ photographer, Dianne Joop, worked within the boundaries of two photographic concepts, one, taking photographs to support the video component and two, capturing photographs to convey a story. Joop composed her shots to give users a sense of being in the caverns, traveling through passages, and making the discovery of the beauty that waits around the corner.



**Figure 4.** Underground landscape in Lower Cave.

Joop previewed photographs to small audiences to test the notion of people having the sense of being “there”. In all instances, audience members affirmed this feeling.

Lastly, both visual elements are implemented to allow for immediate updates, accommodating for new discoveries.

## Summary

When the iCaverns app hits the market, it will be the most comprehensive travel guide / educational app currently available. The app makes cave resources at Carlsbad Caverns National Park available to more than 400 million people, in 155 countries, as well as permitting users to engage in cave and karst educational and interpretive media in 38 languages.

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