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Cover Photo

Entrance side of newly-constructed NCKRI Headquarters.

Back Cover Photo

Opposite side of newly-constructed NCKRI Headquarters.
Photos by George Veni.



Vision Statement

The National Cave and Karst Research Institute (NCKRI) will be the world's premier cave and karst research organization, facilitating and conducting programs in research, education, data management, and stewardship in all fields of speleology through its own efforts and by establishing an international consortium of partners whose individual efforts will be supported to promote cooperation, synergy, flexibility, and creativity.

Organization and Mission

NCKRI was created by the U.S. Congress in 1998 in partnership with the State of New Mexico and the City of Carlsbad. Initially an institute within the National Park Service, NCKRI is now a non-profit 501(c)(3) corporation that retains its federal, state, and city partnerships. Federal and state funding for NCKRI is administered by the New Mexico Institute of Mining and Technology (aka New Mexico Tech or NMT). Funds not produced by agreements through NMT are accepted directly by NCKRI.

NCKRI's enabling legislation, the National Cave and Karst Research Institute Act of 1998, 16 U.S.C. §4310, identifies NCKRI's mission as to:

- 1) further the science of speleology;
- 2) centralize and standardize speleological information;
- 3) foster interdisciplinary cooperation in cave and karst research programs;
- 4) promote public education;
- 5) promote national and international cooperation in protecting the environment for the benefit of cave and karst landforms; and
- 6) promote and develop environmentally sound and sustainable resource management practices.

NCKRI Annual Report Series

NCKRI produces a report of its activities each year. The reporting period covers NCKRI's fiscal year, from 1 July to 30 June of the following year. Digital copies of this and previous reports are available for free at www.nckri.org.

NCKRI is a proud institute of





EXECUTIVE DIRECTOR'S REPORT

Landmarks. The National Cave and Karst Research Institute (NCKRI) established several important physical and figurative landmarks during this 2010-2011 year. The biggest landmark is our newly-built headquarters, which many in the community call “the most beautiful building in Carlsbad” and a model of green and innovative features. More than 350 people came to its opening (pages 2-5)—by far the largest crowd I’ve seen at such an event in Carlsbad. The opening was preceded a week earlier by unveiling the dramatic Jim White Sculpture (page 3), the first of several public art pieces NCKRI plans to host.

In October 2010, we hired Ann Dowdy as NCKRI’s first Advancement Director. Through her we’ve set other key landmarks, such as our membership program, Adopt-A-Bat program, and the establishment of NCKRI as a stakeholder with local to national professional fund raising organizations and programs (pages 6-8). Ann’s talents and skills are bringing new funds, equipments, resources, and many new friends to NCKRI, all of which boost NCKRI’s progress.

NCKRI’s Board approved our Strategic Education Plan in May 2011. This plan gives NCKRI a broad vision for teaching people about caves and karst (page 14). Before implementing some parts of the plan, we are creating the tools to make them possible. Most notably, our website at www.nckri.org is undergoing a complete redesign and should be launched by the time you read these words. Our website will be integral to NCKRI’s public education program. In the meantime, NCKRI’s entry into Facebook and Twitter stand as landmarks in this year’s educational and outreach efforts through social media.

For the first time, NCKRI is providing contract research services. This report describes two projects in New Mexico, one at White Sands National Monument and the other at a brine well in Carlsbad (page 9-11). NCKRI has no intention of becoming a consulting company, but it will conduct consulting projects. When I ran my consulting company for 20 years before coming to NCKRI, I did so in the typical fashion of finishing a project, delivering the report to the client, and then moving on to the next job. Only a tiny fraction of that good work has been published where it can benefit others. NCKRI will focus mostly on projects where the results seem likely to have national and international application. Contracts are in essence no different than research grants, where funds are provided to investigate a question. The difference for NCKRI is that the goal isn’t just to give a client a high quality report, but to take the extra effort and make the information and results widely available. Contract research is a landmark in NCKRI’s operations that is diversifying NCKRI’s research program and providing critical funds needed during the current national economic doldrums.

And there is still much more to do. Now that NCKRI Headquarters is open and we have started designing fabulous exhibits for our museum, we are focusing on raising funds to complete construction of our lab and library and to build those wonderful exhibits—new landmarks we’ll reach in the near future. Despite the national economy, NCKRI continues to grow and make excellent progress, and a big reason for that success is your support and help from all of our partners.

A handwritten signature in black ink, appearing to read "George Veni".

George Veni, Ph.D.

NCKRI HEADQUARTERS

Construction

Wrap-up of construction and getting moved and settled into NCKRI Headquarters took center-stage for much of this year as we finished our first three phases of building. Phase 1 completed the foundation, main structure, exterior, and only the lobby, bookstore, restrooms, and exhibit hall inside. We started Phase 1, knowing it would not give us a fully usable building, but it served the important job of freezing 80% of the construction price from further inflation while we found funds to complete the remaining 20%. The construction would also be an unmistakable testament to our commitment to seeing it finished and thus encourage contributions from other funding sources. The strategy worked! As Phase 1 was wrapping up in December 2009, the City of Carlsbad found funds for the next phase of work.

Phase 2 completed the classroom. For Phase 3, in May 2010 the city again found funds, this time to complete all of the offices, board room, break room, and work room. As this annual report is being written, Phase 3.1 is happening thanks to funding from the National Park Service.

Senator Tom Udall Briefing: NCKRI Headquarters' First Event

NCKRI's first public event occurred even before the furniture was moved in. On January 20, 2011, Senator Tom Udall opened his office in Carlsbad – the first congressional office for the city. He also came to NCKRI Headquarters to learn about the institute's progress, and to attend a briefing by the Bureau of Land Management and the National Park Service on White-Nose Syndrome, which is devastating bat populations in the northeast quarter of the country.



Photo courtesy of NPS

(L-R) Jim Goodbar, BLM; Dr. George Veni, NCKRI; Senator Tom Udall; Dale Pate, NPS; John Benjamin, NPS.

Through their support we are completing the installation of our security system, cabinetry, and much of our landscaping.

Construction wrapped up in December 2010. Before our furniture

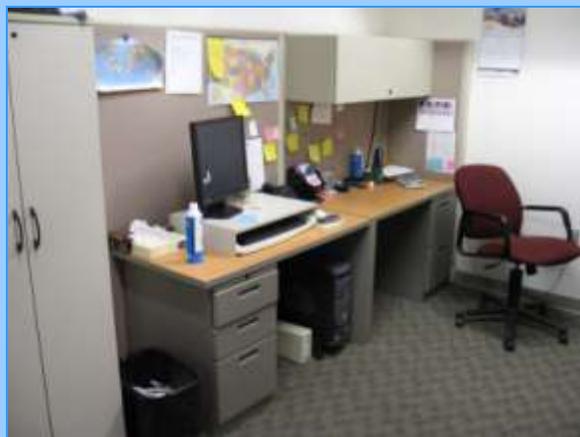
was installed, we held our first event, hosting a special briefing for Senator Tom Udall (see box above). Over the next couple of weeks, the furniture arrived, including a generous donation from New Mexico Tech (see box below, left). On February 24, 2011, we gave a warm "Thank you" to the good people at the Permian Basin Regional Training Center who had leased us our temporary offices for the past 6 years, and settled into our permanent home.

Once moved in, in Spring 2011 we quickly got to work on Phase 4 of our headquarters' development. Following an international search, we hired the renowned Storyline Studios of Bothell, Washington, to design spectacular cave and karst museum exhibits while we search for funds to build them. We postponed fund raising for our final phase of construction, Phase 5, to complete the library and laboratory, until the next year. Instead, we focused on our...

New Mexico Tech Furniture Donation

NCKRI is proud to be one of several superb research and teaching institutes that are a part of the New Mexico Institute of Mining and Technology (NMT).

Due to the current national economic crisis, one of those institutes needed to scale back its program, resulting in a surplus of gently used furniture that NMT distributed to its other institutes. NCKRI thanks NMT for its constant support and guidance, and in this case for \$35,378.31 of office furniture and supplies that we are putting to good use.



Celebration!

On Saturday, May 14, 2011, NCKRI officially opened its headquarters with an *Opening Day Celebration!* that celebrated the broad community of friends, who came together to dream and achieve great things by creating and supporting NCKRI. NCKRI was borne out of a partnership between the federal government through the National Park Service, the State of New Mexico through the New Mexico Institute of Mining and Technology, and the City of Carlsbad. Our headquarters' location came through the Carlsbad De-



Photo by Dianne Gillespie

Cave cake, ready for celebratory dining!

partment of Development's (CDOD) *The Cascades at Carlsbad*. NCKRI's acceptance into the local community was fostered by the Carlsbad Chamber of Commerce, Carlsbad Rotary, and Downtown and Heights Lions' Clubs. The Southwest Region of the National Speleological Society provides extra hands when needed for field research. All print, radio, and



Photo courtesy of Desiree Kicker

NCKRI Board members Jim Goodbar and Ronal Kerbo cut the cave cake. They are two of the three federal cave coordinators who came up with the initial idea of NCKRI.

TV media have long been generous with their time and great coverage. Elected city, county, state, and federal officials have helped at every turn, and multiple federal agencies, universities, organizations, scientists, and individuals from around the world have given NCKRI their support.

NCKRI's celebration included many events and activities for adults and kids:

- exhibits on NCKRI and the caves and karst of the Carlsbad area;
- four lectures by world class cave and karst scientists;
- building tours;
- "Meet a live bat!";
- "Dress like a caver";
- an inflatable cave courtesy of the Bureau of Land Management;
- rock and mineral identification;
- karst groundwater model demonstrations; and
- booths from the CDOD, National Park Service, and US Forest Ser-

vice.

Over 350 people attended! Many donated blood at the United Blood Services bloodmobile.

NCKRI's doors were officially opened caver-style when representatives of New Mexico Tech, Greer Construction Company, and our founding city, state, and federal partners, pulled on a haul line to swing the doors wide. Without their efforts, NCKRI Headquarters would never have been built.



Photo by Dianne Gillespie

The official opening of NCKRI's doors using a caving haul system: (L-R on rope) Dave Steensen (NCKRI Board and National Park Service), retired New Mexico Congressman John Heaton, Richard Cervantes (NCKRI Board and NMT), retired Carlsbad Mayor Bob Forrest, and Greer Construction Company Vice President, Joe Nichols.

Jim White Sculpture

As a prelude to NCKRI's opening eight days later, the bronze sculpture of Jim White was unveiled on May 6, 2011. The sculpture is located at the south end



Photo by Ann Dowdy

Unveiling of the Jim White sculpture by artist Sonny Rivera and the Jim White Sculpture Committee.

of NCKRI Headquarters, greeting visitors as they enter *The Cascades at Carlsbad*. White was the leader of the exploration of Carlsbad Cavern and instrumental in bringing it to national attention, which led to the creation of Carlsbad Caverns National Park. Sculptor Reynaldo "Sonny" Rivera was hailed for his masterful work, which was mostly funded by New Mexico legislature and assistance from several organizations, including NCKRI.

NCKRI HQ: a quick tour

Opening NCKRI Headquarters is a new beginning for the institute. It increases NCKRI's ability to meet its Congressional mandates through:

- more advanced research and educational programs;
- museum exhibits; and
- additional funds from its bookstore, rental of meeting and conference space, enhanced programs, and a generally higher profile.



Photo by Dianne Gillespie
News media and over 350 guests attended NCKRI's Opening Ceremonies.

This page shows people enjoying our opening celebration and headquarters—an environmentally and people-friendly multi-function building with 1,609 m² (17,315 ft²) of space over two levels. The first floor is designed mostly for general visitation. The second floor will be used primarily by researchers and office



Photo courtesy of Desiree Kicker
Inside the inflatable cave provided by the Bureau of Land Management.

visitors. Notable features include:

- The National Cave and Karst Museum encompasses the foyer, lobby, and exhibit hall for a total area of 263 m² (2,827 ft²); traveling and temporary exhibits will be displayed until our permanent exhibits are installed.
- Classroom/conference space totals 174 m² (1,876 ft²) and is designed for meetings, workshops, classes, symposia, and social events, and will seat about 150 people.
- Three stout metal beams for vertical and rescue demonstrations and practice cross NCKRI's courtyard 5.1 m, 7.1 m, and 9.1 m above the courtyard floor. Several rings high in the beams and low in the courtyard walls provide sturdy anchors for rope work.
- NCKRI's bat roost is the first artificial roost in the world to be incorporated into a building's design. It will be carefully monitored to better understand the needs of bats in general and the specific species that will occupy the roost. Video will be streamed to NCKRI's exhibit hall and website and the data will be available to scientists for study.
- NCKRI Headquarters is a model of environmental low-impact and sustainable building and management features and practices. Such practices are especially important when building in karst areas. It also demonstrates how investing in environmentally friendly infrastructure both saves and earns money in the long run.

NCKRI can now begin to move forward at an accelerated rate. We appreciate our friends who have sup-



Photo courtesy of Desiree Kicker
Lechuguilla Cave exhibit, donated by Carlsbad Caverns National Park.



Photo courtesy of Desiree Kicker
Visitors enjoying booths and exhibits in the Exhibit Hall.

ported us this far and welcome new friends to join us. The opening day event is over, but the party to study, teach about, and manage caves and karst is just beginning.



Photo courtesy of Desiree Kicker
Kids loved to "Dress like a caver!"

Awards

An important aspect of NCKRI's Opening Day Celebration was for NCKRI to recognize and thank the community, organizations, and individual friends who have been so supportive. This made the event the ideal time to launch NCKRI's Awards Program. Two awards were given.

2011 Distinguished Service Award recipient:

Dr. Patricia Selser

This award is given to a person or organization in recognition of outstanding long-term volunteer service to NCKRI. No more than one award of this type will be issued each year, and no more than one per individual or organization.

Dr. Seiser epitomizes the type of person for whom this award was designed. She volunteered her time and talents day-in and day-out for NCKRI for over four years. She attended dozens of meetings on behalf of NCKRI. She gave dozens of presentations to classes, workshops, conferences, and organizations for NCKRI and to promote NCKRI. She arranged the NCKRI-sponsored cross-country trip for Australia's Dr. Elery Hamilton-Smith and drove/escorted him around the country for 3 months. She coordinated distinguished lectures, proofread publications, handled administrative issues, and conducted field work throughout her volunteer tenure. In many ways, she was the face of NCKRI during its transition period from a federal to non-profit institute, answering phones and e-mails, providing information, attending functions, and otherwise filling in however she was needed. While other obligations have recently reduced her activity with NCKRI, she still serves as NCKRI's liaison with the National Speleological Society and works to increase the level of partnership between the organizations. In many ways, NCKRI would not have come so far if not for the efforts of Dr. Patricia Seiser.



Photo by George Veni

Dr. Patricia Selser shows her Distinguished Service Award.



Photo courtesy of Paula Bauer

NCKRI Director and Awards Committee Chairman, Dr. Ron Green (right) reads the accomplishments of Dr. Kevin Stafford (left) to the crowd at the Opening Day Celebration; the limestone plaque award is shown below



2011 Meritorious Service Award recipient: Dr. Kevin Stafford

This award is given to an individual or organization in recognition for exceptional volunteer service on a specific NCKRI project or activity. No more than one award of this type will be issued each year. There is no limit to the number of times an individual or organization may receive this award.

Dr. Stafford was the Editor-in-Chief in 2009 for *NCKRI Symposium 1, Advances in Hypogene Karst Studies*. He took on this entirely voluntary task during his first year as an assistant professor in the Geology Department at Stephen F. Austin State University, Nacogdoches, Texas. In that tenure-track position he was expected to develop a hydrology and hydrogeology curriculum for graduates and undergraduates. A hydrology program had not previously been offered in that department, so Kevin was starting completely from scratch. Nonetheless, he took on this additional project.

For those not familiar with the requirements of editing a publication like this, it meant calling, e-mailing, encouraging, and at times badgering authors to stay on schedule in delivering their papers, and then do the same for those reviewing the papers. It meant working with the authors and printer to make sure the photos would reproduce well, and to attractively lay out all of the text, figures, and photos. It required reading each paper several times to make sure that errors were not accidentally introduced by the revisions and layout. With this specific publication, since it was NCKRI's first in the Symposium Series, it also meant drafting a *Call for Papers, Instructions to Authors*, and other associated documents and procedures that will streamline NCKRI's work on future publications. Lastly, it should be noted that Kevin did not need to be coerced into this lead editorship. He saw the need, readily volunteered, and did a superb, professional job.

ADVANCEMENT

Celebrating Support and Our New Advancement Program

What a benchmark year for NCKRI! Not only did we move into and open a new facility but we also created and began to implement the new Advancement Program. Just seven months ago the Advancement Office was established to position, support, and advance NCKRI's mission, and it is responsible for membership, fundraising and development, news and communications, marketing, community relations, and special events.

2010-2011 Advancement Highlights

- On October 25, 2010, Ann Dowdy became NCKRI's first Advancement Director. Ann has over 28 years of fundraising experience with a degree in Organizational Communications from St. Edward's University, Austin, Texas and philanthropic certification from St. Edward's University and the Texas Association of Non-profit Organizations.
- The NCKRI Board of Director's adopted a Gift Acceptance Policy.
- Raiser's Edge, a comprehensive development software program, was purchased. This major pur-



Photo courtesy of Desiree Kicker
One of the special guests at the opening included the National Park Service's Carl S. Bat, shown here with fan and friend Chase Kicker.

chase lays the foundation groundwork for the fundraising program for years to come.

- NCKRI has teamed up with www.goodshop.com and www.goodsearch.com. Supporters can now help raise funds for NCKRI by searching the internet and shopping at web sites.
- There was 100% participation in annual fund giving by the Board of Directors during FY 2010-2011.



Logo designed by Dianne Gillespie.

- NCKRI's Annual Membership program kicked off on May 14, 2011. The annual membership program is offered to all interested persons wanting to support NCKRI and to participate in the programs, activities, and other opportunities offered by the National Cave and Karst Research Institute and Museum. You can join online at www.nckri.org or call the Advancement office at 575-628-2702 to join using your Visa, MasterCard, American Express, or Discover card. When you become a member, you will receive a quarterly digital newsletter, reduced rates on special presentations, classes, lectures, and rentals and other educational programs, as well as discounts in the Museum Store.
- NCKRI can now accept gifts of cash, in-kind, stocks and bonds, and through a new giving program called "Legacy Cavers," donors can leave a gift to NCKRI through planned giving.
- A "Wish List" of items has been compiled by staff and is being distributed to potential donors.

- Advancement is active in the Carlsbad Rotary Club, the Carlsbad Chamber of Commerce, the Tourism Association of New Mexico, the American Association of Museums, Association of Fundraising Professionals, New Mexico Museum Association, Texas Association of Museums, Museum Store Association, and the Texas Association of Non-profit Organizations.
- NCKRI's first list of contributors is being published in this annual report. It is a great start to a new fundraising effort.
- NCKRI is now registered at www.guidestar.org, Mission Fish/eBay, grants.gov, the New Mexico Attorney General's Office Charitable Organizations Registrar, the Better Business Bureau's Wise Giving Alliance, and New Mexico Non-profits.
- The Adopt-A-Bat program launched in May 2011 and will help raise funds for the maintenance and equipment needed for NCKRI's Bat Roost. NCKRI Headquarters is the first building in the world with a bat roost as part of its design! The NCKRI roost is made of concrete and it is a part of the building. Once the NCKRI roost is occupied, we will ask people to not get under the roost. We are installing tiny cameras in the roost. The metal doors in the floor of our Bat Roost Office on



Photo by Ann Dowdy
NCKRI friend and supporter, Martha Mauritson, Carlsbad Current-Argus Managing Editor, adopted the first bat on May 12, 2011.

the second floor will let us install cameras, microphones, and other probes into the roost without bothering the bats. You will be able to watch the bats on our website, and later in one of our museum exhibits.



Logo designed by Dianne Gillespie.

- Each adoption is only \$25 and includes: a Certificate of Adoption, educational information about the NCKRI Bat Roost and Bats, and your very own “Barty the Bat.” You do not receive a live bat. For more information and to Adopt-A-Bat visit www.nckri.org.
- NCKRI’s Facebook page launched in conjunction with the opening of the new building in May 2011. Join us on Facebook and follow our adventures.
- NCKRI’s Distinguished Lecture Series was part of the programming during the opening on May 14, 2011. Speakers included: Dr. Penny Boston, Debbie Buecher, Dr. John (Jack) Hess, and Geary Schindel.
- NCKRI supported the Carlsbad Museum & Art Center’s exhibit, “Underground of Enchantment.”



Photo courtesy of Desiree Kicker
Debbie Buecher, wildlife biologist and bat specialist shows an audience a mastiff bat.

Partnering for a Strong Institute

Founding Partners

NCKRI’s Founding Partners were those present and who played a crucial role in NCKRI’s creation. Today, they continue to serve as major supporting partners in many ways. Each Founding Partner maintains one permanent position on NCKRI’s Board of Directors:

- City of Carlsbad,
- New Mexico Institute of Mining and Technology, and
- US National Park Service.

Education Partners

Bat Conservation International
Carlsbad Municipal Schools
Geological Society of America
Hoffman Environmental Research Institute/Western Kentucky University
National Speleological Society
NASA
New Mexico Institute of Mining and Technology
University of New Mexico
University of South Florida
US Bureau of Land Management
US Fish and Wildlife Service
US Forest Service
US Geologic Survey
US National Park Service

International Partners

Emil Racovita Institute of Speleology
International Union of Speleology
Karst Research Institute
Ukrainian Institute of Speleology and Karstology

Research Partners

Bat Conservation International
Edwards Aquifer Authority
Fort Stanton Cave Study Project
Hoffman Environmental Research Institute/Western Kentucky University
New Mexico Bureau of Geology and Mineral Resources
University of New Mexico
US Bureau of Land Management
US Geologic Survey
US National Park Service

Stewardship Partners

Bat Conservation International
Edwards Aquifer Authority
Hoffman Environmental Research Institute/Western Kentucky University
National Speleological Society
US Bureau of Land Management
US Fish and Wildlife Service
US Forest Service
US Geologic Survey
US National Park Service

Giving Recognition

Annual Giving

Our Annual Giving Program recognizes those individuals and corporations who made gifts or pledges during FY 2010-2011:

Bacon Lee and Associates
Margaret and John Barry
Paula Bauer and Dale Pate
Dick Billings
Dr. Van Brahana
Dr. Robert Brinkmann
Dr. Harry Burgess
Khloe Campbell
Carlsbad Chamber of Commerce
Carlsbad Current-Argus
Carlsbad Museum and Art Center
Carlsbad Radio Stations, 104.1 FM KCDY, 92.1 FM KATK, 1240 AM KAMQ and MIX 104.1
Richard Cervantes
Todd Chavez
Ann and Terry Dowdy
Garden Mart, Inc.
Dianne Gillespie
Jim Goodbar
Dr. Ronald T. Green
Gunn, Lee & Cave, P.C.
Dr. John (Jack) Hess
Hobby Lobby, Roswell
JellyCat, Inc.
Michael Kehs
Ronald Kerbo
Aaron Kirsten
KOBR-TV 8
Lands’ End Business Outfitters
Lucky Duck Printing LLC
Pat Mack
Albert Marchione
Martha Mauritsen
Hazel Medville
New Mexico State University at Carlsbad
Papa Murphy’s

Dr. George Placitas
 Jesse Richardson
 Fernando Santana
 Geary Schindel
 Dr. Patricia Seiser
 Sew What!
 Dr. Kevin Stafford
 Bill Steele
 Dave Steensen
 Thomas Strong
 Judy Stubbs
 Sunset Elementary School
 United Blood Services
 US Bureau of Land Management
 US Cable Community Channel 23
 US Forest Service
 US National Park Service
 Karen Veni
 David Weary
 J.G. Wheeler

Through gifts to the **Annual Giving** program, our supporters demonstrate their regard for the National Cave and Karst Research Institute, its mission, and their desire to support that mission.

Give Online: The simplest way to give. Visit www.nckri.org to make your gift.

Give by telephone with a credit card: Call our Advancement Office at 575-628-2702 and we will assist you in making your gift.

Give through the mail: Use the contribution envelope included in the printed Annual Report to make your gift.

Legacy Covers

NCKRI's **Legacy Covers** are donors who have chosen to make a planned or deferred gift through their estate planning that will have an everlasting impact on the organization. Planned or deferred gifts include: bequest through a will, charitable gift annuity, charitable remainder trust, charitable lead trust, and gift of life insurance, real estate, or other assets.

Gifts such as this not only help NCKRI, but also provide the donor with additional income, convert low income assets to higher income assets, help care for your surviving family members, avoid long-term capital gains tax, reduce your estate taxes, and generate income tax deductions.

The NCKRI Advancement staff will work with you in arranging proper forms of recognition that reflect your personal gift's purpose and your preferences. Your gift may



Photo by George Veni

Caver and master wood sculptor Michael Kehs created 15 name plates for NCKRI's offices and second floor work rooms, each custom designed to the function of the room or interests of its occupant.

also be given anonymously. For tax purposes, the National Cave and Karst Research Institute is a 501(c)(3) with a tax exempt ID: #42-1741207. NCKRI has not retained any professional solicitor and **100% of each contribution is received directly by NCKRI.** For more information on leaving a legacy, please call 575-628-2702.

Thank you for your support and for being an important part of NCKRI's future.

Scholarships Change Lives

Scholarship support is one of the most important ways to impact the lives of students. There are several ways to support student scholarships at the National Cave and Karst Research Institute:

- Through NCKRI's Annual Giving program;
- By making a gift to an existing scholarship fund; or
- By creating a new scholarship fund.

You can designate your program of choice and name the scholarship fund in memory or honor of someone. We'd love to talk with you about your ideas.

Giving to the Future of NCKRI

Private gifts support the important mission of the National Cave and Karst Research Institute. Your contributions enhance programs, provide for excellence in staff, and support research programs. Thank you for your generosity and for making NCKRI a priority in your charitable giving choices.

Many Ways to Give

At the National Cave and Karst Research Institute, every gift is making a difference. Through **Annual Giving** at NCKRI, donors and friends support the areas of greatest need; including scholarships, equipment, facilities, maintenance and improvements, research, and exhibit development. The annual fund is the cornerstone of our fundraising program.



Photo courtesy of Paula Bauer

Carlsbad Radio was broadcasting during NCKRI's Opening Day

Geophysical Investigations

NCKRI expanded its electrical resistivity (ER) survey program this year to include a broad variety of surface and subsurface karst features in southeastern New Mexico. This work made use of the AGI SuperSting R8/IP™ resistivity equipment and Topcon GR3 global positioning system acquired during the previous fiscal year. Resistivity profiles collected with the SuperSting equipment package illustrate vertical and lateral variations in subsurface resistivity, and are strongly affected by the presence of air or water-filled conduits. The resistivity method is thus well-suited for investigations of karst phenomena.

Depth of investigation of a resistivity survey is directly related to length of the array of electrodes. Many of the surveys conducted this year used 112 electrodes in a pole-dipole configuration for a maximum depth of investigation of ~230 m.

Fort Stanton Cave

NCKRI personnel conducted our first use of a full 112 electrode array over a projected southwest extension of the Snowy River passage of Fort Stanton Cave in the northern Sacramento Mountains. The surveyed length of Fort Stanton Cave is currently 23.8 km, making it the third-longest cave in the state, after Carlsbad Cavern and Lechuguilla Cave. Snowy River is a passage more than 7 km long and its southern limit is nearing the limit of what can be explored from the cave's entrance. This project involved deploying almost 700 m of electrical cable with assistance from 10 volunteers from the Fort Stanton Cave Study Project. The results of the ER surveys show high-resistivity anomalies several hundred meters southwest of the end of cave survey in Snowy River South, ~120 meters below ground level, indicating that the passage continues in that direction for at least another half kilometer.

White Sands National Monument

NCKRI staff hydrologist Dr. Lewis Land spent five days in December, 2010 conducting ER surveys at White Sands National Monument (WSNM), as part of a long-term project conducted by colleagues with the New Mexico Bureau of Geology and Mineral Resources. This investigation was the first externally-funded project using the Institute's SuperSting resistivity equipment.



Photo by Lewis Land
Eastern margin of gypsum dunes at White Sands National Monument, New Mexico.

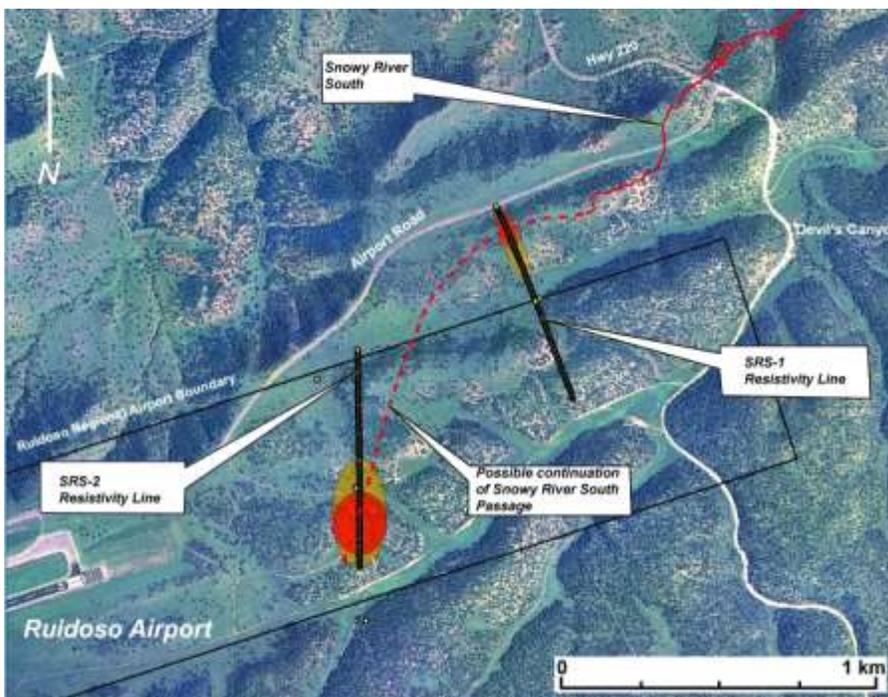


Image courtesy of John Corcoran, III; Modified
Map showing locations of resistivity anomalies (red ovals) over projected southwest extension of the Snowy River passage of Fort Stanton Cave (dashed red line).

The goal of the larger study, which is funded by the National Park Service, is to characterize the local and sub-regional hydrology of the dune fields and adjacent areas within the Monument, and their relationship to regional hydrologic conditions in the Tularosa Basin. The gypsum dune sands at WSNM are an exceptionally challenging environment for conducting electrical resistivity surveys because of the very high contact resistance usually encountered between the electrodes and the sand.

Results at WSNM show that resistivity methods can be conducted in aeolian dune sand. Total dissolved solids (TDS) content of groundwater contained within the dunes and adjacent areas appears to be the main factor controlling resistivity distribution. In most areas surveyed, shallow perched aquifers containing water of variable TDS overlie an extensive, deeper, low-resistivity brine-filled aquifer system.

Brine Well Cavity Sinkholes

NCKRI personnel also conducted electrical resistivity surveys adjacent to the JWS and Loco Hills sinkholes in northern Eddy County, New Mexico. Both of these sinkholes formed in 2008 by the collapse of cavities created by brine wells solution-mining bedded salt in the Permian Salado Formation ~140 m below ground level. These surveys were conducted as a proof of concept of the use of electrical resistivity methods for investigations of brine-filled cavities associated with solution mining operations. Field assistance was provided by volunteers from the Fort Stanton Cave Study Project, National Park Service, Pecos Valley Grotto, and US Bureau of Land Management-Carlsbad Field Office.

Data from an ER survey conducted ~15 m from the southern edge of the JWS Sinkhole show a near-surface zone of high apparent resistivity, probably caused by air-filled pore space in near-surface Quaternary alluvium. Most of the profile is dominated by a ~130 m wide zone of very low resistivity, slightly offset from the position of the JWS Sinkhole as projected onto the survey line. Resistivity values of <5 ohm-m are consistent with high-salinity groundwater, and suggest the presence of a large, brine- or brine-saturated breccia-filled cavity ~80 m below ground level. An ER survey of the Loco Hills Sinkhole showed similar results, but also revealed a possible plume of hydrocarbons from materials used to fill the sinkhole.



Photo by Lewis Land

Aerial view of JWS Sinkhole, northern Eddy County, New Mexico; diameter is 111 m and depth is approximately 40 m.

I&W Brine Well Survey: Trying to Prevent a Collapse

Collapse of the JWS and Loco Hills brine well cavities prompted the New Mexico Oil Conservation Division (NMOCD) to review its regulations regarding brine well operations in the New Mexico oil fields. During the review, the I&W brine well facility, located within the city limits of Carlsbad, New Mexico, was identified as having a similar geologic setting and pumping history. Unlike the northern Eddy County sinkholes, which are located in remote areas of the southeastern New Mexico oil fields, the I&W operation is sited in a more densely populated area within the city of Carlsbad near a rail line and the intersection of two major highways. A catastrophic collapse in this area would inflict extensive damage to individual property and civic infrastructure.

On April 6-11, 2011, NCKRI personnel under contract with NMOCD deployed six ER survey lines over the I&W site. Each line was surveyed using the Institute's Topcon GPS equipment. The presence of urban infrastructure presented significant challenges since electrical cable had to be deployed through densely populated areas, beneath chain-link fences, and across roadways and an irrigation canal. Additionally, many of these obstacles were potential sources of electrical interference that could ruin the survey. In spite of these challenges, all ER profiles yielded coherent results and attained a maximum depth of investigation of ~228 m, extending below the

base of the Salado salt beds.

Results of the survey show a prominent zone of low resistivity directly below the I&W Eugenie #1 wellhead, as well as other low resistivity zones beneath the site that represent either open cavities or highly fractured and/or brecciated zones that are saturated with brine. These low resistivity zones extend to the north beneath the highway intersection and south beneath residential areas south of the irrigation canal. The data sug-



Photo by George Veni

Carlsbad Irrigation District South Canal. SuperSting resistivity meter deployed near center of figure; Topcon GPS base receiver to right. The I&W survey was the first ER project NCKRI personnel conducted that involved a water crossing.

gest that solution mining of the Salado Formation has caused significant upward stoping into overlying mudstone, dolomite and gypsum of the Rustler Formation.

NCKRI's ER results provide additional insight to two other methods employed by NMOCD to define the size and shape of the cavity and the condition of the surrounding bedrock and overlying alluvium. The purpose of these studies is to determine the best method for preventing a collapse, and not accidentally triggering a collapse in the process. Until remediation begins, an extensive and highly sensitive series of equipment monitors the site for the slightest movement, and is connected to alarms that notify local emergency services.



Map showing locations of possible subsurface cavities in Rustler and Salado formations. Solid red highlighted lines indicate areas of probable cavity formation. Dashed red lines show areas of possible brine-saturated breccia. The area outlined by a solid yellow line is probably underlain by a solution cavity; dashed yellow lines are areas of low resistivity.

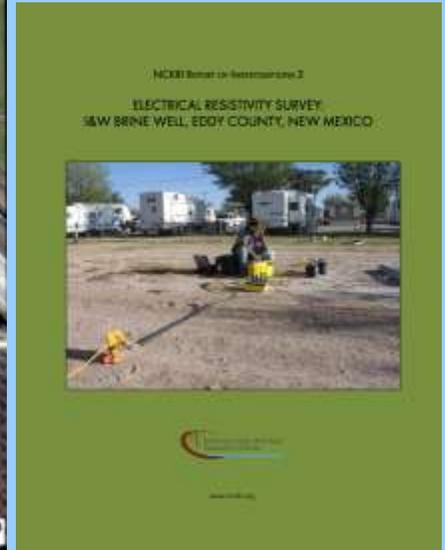
NASA Infrared Instrument Development

In the third year of this project, the unique, tunable acousto-optical laser spectrometer is being lab tested with a test suite of cave geomicrobial materials and other cave minerals developed by Dr. Boston and her

team. Plans continue for deploying a field testable unit in late 2011 or early 2012 in a selection of caves with microbially significant environments and in other unique environments. NASA is funding this research, using caves as models for where microbial life might be found on other planets.

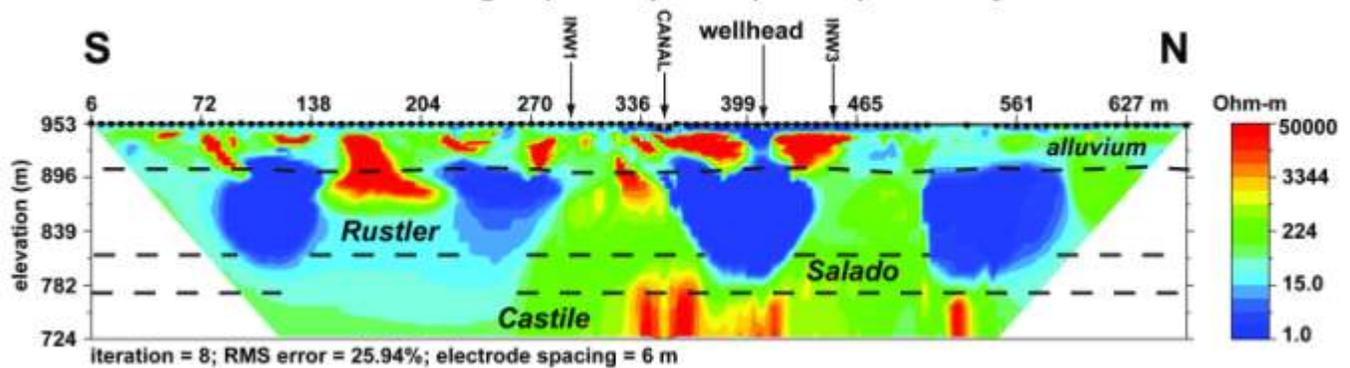
Reports of Investigation

NCKRI established this new report series in 2011 to publish the findings of its research projects. The reports are produced on a non-regular schedule determined by the timing of the investigations. This series is not limited to any topic or field of research, except that



they involve caves and/or karst. To minimize environmental impact, generally few or no copies will be printed. Digital copies are available for free at www.nckri.org. The first two Reports of Investigation describe the I&W electrical resistivity survey described on the previous page, and the Guatemalan karst flooding remediation study described on the next page.

INW4: merged pole-dipole dipole-dipole arrays



INW4 ER line, which passed within 2 meters of the I&W Eugenie #1 wellhead.

Karst Flooding in Guatemala

In February 2011, NCKRI joined a humanitarian karst flood control project with Engineers without Borders (EWB), a non-profit organization based in Chicago, Illinois. Dr. Lewis Land spent two weeks in Guatemala working with EWB's team of engineers to investigate the possibility of constructing a ditch to divert flood waters around the village of Las Cruces, in western Peten.

Conversion of the forest upstream of the village to agricultural land, combined with large storms, caused severe flooding in Las Cruces during the past three years. The area is underlain with limestone, and a small cave, El Tragante, is located in the center of town. Prior to clearing the forest, all floodwaters would flow into the cave. The villagers also use the cave to dispose of graywater and some raw sewage, which has obvious potential to contaminate the underlying karst aquifer. EWB was concerned that their proposed flood control ditch might encounter near-surface caves, exacerbating aquifer contamination and flooding, since some of the flooding was caused by water rising from wells due to too much water going underground.

Dr. Land supervised the digging of 24 test pits to determine depth to bedrock and the potential for shallow caves in the area. Results of the test



Photo by Lewis Land

Pipe discharging raw sewage into El Tragante Cave, Las Cruces, Peten, Guatemala.

pit survey, coupled with observations of the local geology, indicate the presence of an irregular bedrock surface overlain by one to several meters of clay and silt. Limestone bedrock is probably more than 4 m deep over ~90% of the length of the proposed ditch. Near-surface bedrock (<4 m) was encountered in three pits over a distance of roughly 500 m, along which more difficult construction conditions should be anticipated. No caves were encountered during test pit excavations.

Logistical factors prevented use of NCKRI's electrical resistivity equipment to determine if caves occur below the thicker soils. If so, the soils in the ditch floor might wash into the caves and collapse the ditch. NCKRI proposed lining the ditch to prevent or minimize infiltration that could lead to collapse.

Naica Cave: Giant Hot Crystals, Amazing Microorganisms

Dr. Penny Boston in collaboration with Dr. Diana Northup and Michael Spilde (University of New Mexico) continues to analyze materials collected during the 2008 and 2009 Naica expeditions to Chihuahua, Mexico.

The Naica mines intersect several caves, some of which are nearly as hot as 50° C (120° F) and contain gypsum crystals up to 10 m long. The crystals formed when hot water filled the cave, now drained by the mining, and hold promise for containing unique microorganisms, trapped in tiny pockets of fluid in the gypsum.

Based on DNA analyses, the nearest relatives to the microorganisms found in this remarkable system include microbes from other caves elsewhere in the world, volcanic soils, heavy metals, and other unique environments. Dr. Boston's work was highlighted this year in the National Geographic television documentary, *Return to the Giant Crystal Caves*, the much anticipated sequel to the *Giant Crystal Cave*.



Photo by Lewis Land

Graywater discharging into a drainage canal and recharging the karst aquifer, Las Cruces, Peten, Guatemala.

Karst Information Portal

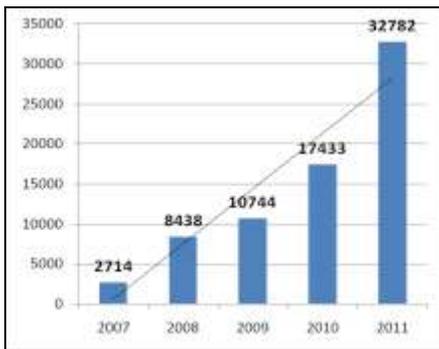
The Karst Information Portal (KIP) is a joint project of NCKRI, University of South Florida (USF), University of New Mexico, and the International Union of Speleology (UIS). It is an on-line cave and karst reference source and research tool.

KIP usage continues to expand. The graph below reflects usage through August 1, 2011. Google referrals account for 71% of visits. The registered user base has expanded to 385 individuals. Approximately 37% of the content collection includes digital objects.

We continue to digitize Dr. George Veni's private library of technical reports and make them accessible via KIP. We continue to focus on adding records for content from Latin America including *EspeleoAR*, *Noti-FEALC*, *Espeleocol*, and *Mundos Subterranos*. We just completed the digitization of *The Texas Caver* and will be entering the metadata in the coming months.

The Geoportal launched in March 2011 and we are populating it with content in several fields including karst, archaeology, and climate change. This repository offers online mapping services and access to initial core geospatial data that will opportunistically expand to include karst-relevant information. This marks a \$52,000 new investment in the KIP initiative in 2011.

We are now working on a stand-alone Cave Life Bibliography. It is built on the foundation of data collected by several scientists, notably Dr. William Elliott and James Reddell. Dr. Elliott is working with us to get the framework in shape so that we can import the over 25,000 records that he and his colleagues have collected in past years.



KIP usage 2007 to July 2011.

Metadata Element	Current	Change from 2009
Number of Classifications	173	+12
Number of Controlled Names	7,840	+204
Resources Published for Viewing	4,992	+393
Total Number of Resources	5,945	+417
Total Distinct Resource Search Terms	38,416	+4,895

Granite Cave Microbiology: Spain and Portugal

Dr. Penny Boston and her team have begun to work on the geomicrobiology and mineralogy of granite caves in northern Spain and northern Portugal in collaboration with Dr. Juan-Ramon Vidal Romani at the University of Coruna, Spain. The team is testing the hypothesis that the presence of heavy microbial colonization on the granite walls is helping to mobilize the silica in the granite rocks and enabling production of unusual opal speleothems within these systems.

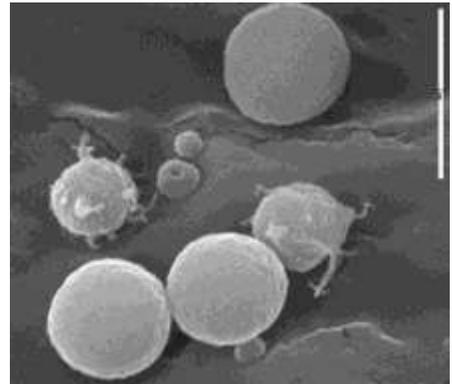


Photo by Penny Boston
(Above) *Folon Cave, Spain, wall showing thick white microbial growth.*

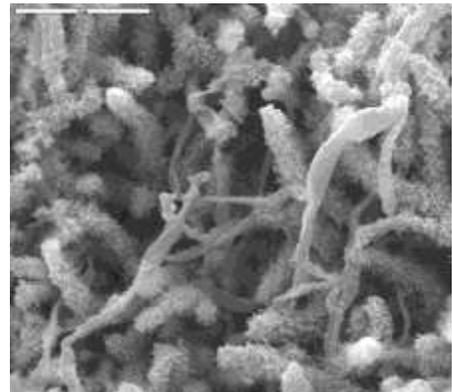
SEM image by M.N. Spilde and P.J. Boston
(Right) *Fuzzy actinobacteria growing on the walls of Trappa Cave, Gallacia, Spain. Cave walls are liberally coated with a heavy microbial growth. The organisms are coated in thin layers of opal silicate mineral.*

Smallest Bacteria Discovered

Samples collected in 2010 from the Ghost Town area in the eastern branch of Lechuguilla Cave, Carlsbad Caverns National Park, New Mexico, have yielded some of the smallest confirmed bacterial sizes known. These tiny bacteria and much larger cousins liberally coat biofilm and mud speleothems that resemble drippy miniature stalactites. These structures are excellent examples of a geomicrobial cave material that includes mineral, clay, biological, and biofilm components.



SEM image by M.N. Spilde and P.J. Boston
(Above) *Large spherical bacteria, medium sized bacteria with furry projections, and extremely tiny cave nanobacteria from Lechuguilla Cave.*



EDUCATION PROGRAM

NCKRI's Strategic Education Plan

In June 2009 NCKRI Education Director, Dianne Gillespie, began a fact-finding and partnership-building expedition across the US to establish a foundation for NCKRI's Strategic Education Plan (SEP). Ms. Gillespie found many great cave and karst educational programs, some active, but some suffering the effects of the US economic downturn. She used the knowledge gained from the research expedition, and from the directive and recommendations of recent legislation and reports, to develop the SEP and NCKRI's Education Program goals.



Strategic Education Plan

Maintaining or restoring the integrity of cave and karst systems depends upon public understanding of their importance to people's daily lives and as repositories of significant biological, geological, hydrological, paleoclimatological, and cultural resources. Research, education, and stewardship are imperative parts of NCKRI's vision. NCKRI's educational mission is to provide cutting-edge academic and

education programs and work in collaboration with others to elevate the world's knowledge of caves and karst. In accordance with our mandates, NCKRI's educational efforts will:

1. Further the science of speleology by:
 - Promoting the integration of speleology and topics within the framework of the sciences and standardized curriculum.
 - Contributing to the development of the nation's science, technology, engineering, and math (STEM) workforce, at all levels.
 - Contributing to the development of students in cave and karst sciences.
2. Centralize and standardize speleological information by developing a physical and virtual cave and karst educational library.
3. Foster interdisciplinary cooperation in cave and karst research by:
 - Developing and facilitating cave and karst research and stewardship projects.
 - Developing world-class cave and karst research facilities.
4. Promote public education by:
 - Developing an interactive and engaging cave and karst museum.
 - Developing and facilitating formal, non-formal, and informal educational programs.
 - Developing and utilizing mass communication media, products, and programs.
 - Building strategic partnerships with other educational institutions and programs to promote and integrate cave and karst sciences and topics.
5. Promote national and international cooperation in the protection of the environment for the benefit of caves and karst by:
 - Engaging national and interna-

tional audiences in NCKRI's vision and mission.

- Developing and facilitating educational and outreach products and programs for national and international cave and karst audiences.
 - Utilizing mass communication media to disseminate information, policies, and best practices for cave and karst environmental protection.
6. Promote and develop environmentally sound and sustainable resource management practices by:
 - Developing, conducting, facilitating, or supporting cave and karst symposia.
 - Developing, conducting, facilitating, or supporting trainings, or workshops to disseminate best practices for cave and karst management.
 - Contributing to the development of the cave and karst workforce.

Education Program Goals

NCKRI's Education Program encompasses two major projects, i-CAVER (International Cave/Karst Awareness Via Education and Research) and the National Cave and Karst Museum (NCKM). We are building a program to increase the perception, awareness, and knowledge of caves and karst by developing high-quality educational products and programs and through strategic collaborations and partnerships. Program goals include:

1. Provide a lifelong continuum of informal educational opportunities by developing inspiring events, exhibits, expeditions, curricula, tours, and publications to engage the public in NCKRI's vision as well as cave and karst topics, facilitated through mass communication, seminars, symposia, and NCKM.

2. Develop a Cave and Karst Studies program facilitated through NCKM for cave and karst hobbyists, citizen scientists, educators, students, and managers.
3. Develop and facilitate cave and karst related stewardship and citizen science projects.
4. Provide continuing education and training experiences for pre-service and in-service cave and karst educators and managers.
5. Build strategic partnerships with agencies and organizations conducting educational programs in topics such as climatology, environmental ethics, environmental sciences, geography, geology, hydrology, paleontology, and speleology.
6. Promote the development of middle and high school students to seek careers in the fields of science, technology, engineering and mathematics, particularly in cave and karst related disciplines.
7. Develop high-quality educational curricula for international distribution through NCKRI's consortium of partners.
8. Promote the integration of cave and karst topics into international and national educational standards.
9. Develop and facilitate informal and formal curricula, products, and programs that elevate the public's perception of caves and karst.
10. Become a clearinghouse for cave and karst educational products, and develop and acquire educational resources for NCKRI's physical library and the Karst Information Portal.

Education Program Projects *i-CAVER*

i-CAVER (International Cave/karst Awareness Via Education and Research) will be NCKRI's primary vehicle for international and national educational and outreach curricula, programs and products (publications, maps, videos, teaching aids, etc.). *i-CAVER* will incorporate Project CAVERN, CAVER and Expedition CAVER as those materials are developed and refined, and then modified

linguistically and culturally for international audiences; multiple versions will be created.

National Cave and Karst Museum

NCKRI Headquarters will contain the National Cave and Karst Museum (NCKM). NCKRI will develop exciting, state-of-the-art exhibits, a bookstore, and on-site education programs through work with federal land management agencies, the state of New Mexico, the City of Carlsbad, New Mexico Tech, other university partners, cave and karst organizations, and local school districts. Exhibits and educational programs will be developed to attract visitors and inform them about important cave and karst issues. The NCKRI bookstore will distribute educational materials and products developed by NCKRI, in addition to a variety of retail items related to caves and karst.

Classroom space, when not used for meetings, workshops, conferences, and other activities, will be available for temporary exhibits on current research, and traveling exhibits.

Boy Scouts of America

NCKRI sponsors a local Boy Scouts of America (BSA) Career Exploring-Venture Crew in Carlsbad, New Mexico. A venture crew is a BSA youth development program. Venturing gives young men and women positive experiences that help prepare them to become caring and responsible adults.

Karst Field Trip for the Mobility Impaired

Ms. Gillespie continues to work with Dr. Christopher Atchison, Georgia State University, and others to develop a unique field trip for the 2011 Geological Society of America Convention. This trip will promote opportunity for non-traditional, mobility impaired geo-science students to engage in learning in the field. It will include a research trip into a cave.

Carlsbad Municipal Schools Exhibit for NCKRI's Opening Day Celebration

Ms. Gillespie approached the Carlsbad Municipal Schools to partner with NCKRI in developing our temporary exhibits for our Opening Day Celebration. This meeting resulted in the production of a donated piece to the NCKRI "Local Caves and Karst" exhibit by Sunset Elementary.



Photo by Dianne Gillespie
Project piece donated to NCKRI by Sunset Elementary School.

NCKRI Museum Exhibits

Dr. Veni and Ms. Gillespie met with Storyline Studios, NCKRI's museum exhibit designers to begin planning the development of permanent exhibits. They discussed caves, karst, and the opportunities and challenges NCKRI faces with interpreting these resources. As a part of this meeting, the NCKRI team conducted in-cave tours of two local caves to facilitate an understanding about caves and karst for Storyline.

Jewel Cave Bat Watch

Funding is approved for a bat monitoring project at Jewel Cave National Monument. Video of the bats will stream as a live-feed to www.nckri.org as a watchable wild-

life educational experience and exhibit. Ms. Gillespie will be working with Jewel Cave National Monument staff to coordinate the educational component of this project.

US Forest Service Cave and Karst Resource Management Training

Cave and karst resources present land managers with unique conditions and challenges because these complex and intricate hydrological and ecological systems require individuals to encompass and grasp multiple scientific disciplines for effective management. White-nose Syndrome (WNS), a newly discovered wildlife disease affecting hibernating bats, has placed unprecedented demands on federal land and natural resource managers.



Photo courtesy of Val Hildreth-Werker
WNS decontamination procedures before field study in Bowden Cave, West Virginia.

WNS is a rapidly spreading and poorly understood disease that has caused the death of millions of bats. Federal land agencies have issued closure of all caves on federal lands in the hope of slowing the spread of WNS and avoiding impact to cave-obligate biota. In addition, federal agencies have collaborated on a National WNS Management Plan, which raised the demand for proper management of both bats and critical bat habitat, and resulted in an increase in professionals responsible for cave management and thus the need for effective cave management training.

The US Forest Service, NCKRI, and National Speleological Society's

Conservation Division designed the *US Forest Service Cave and Karst Resource Management Training*, which included the essentials of partnership cultivation. The June 2010 course was held in Elkins, West Virginia in cooperation with the Monongahela National Forest, with a combination of classroom and field instruction.



Photo courtesy of Val Hildreth-Werker
Karst Resource Management trainee learns graffiti removal techniques Bowden Cave, West Virginia.

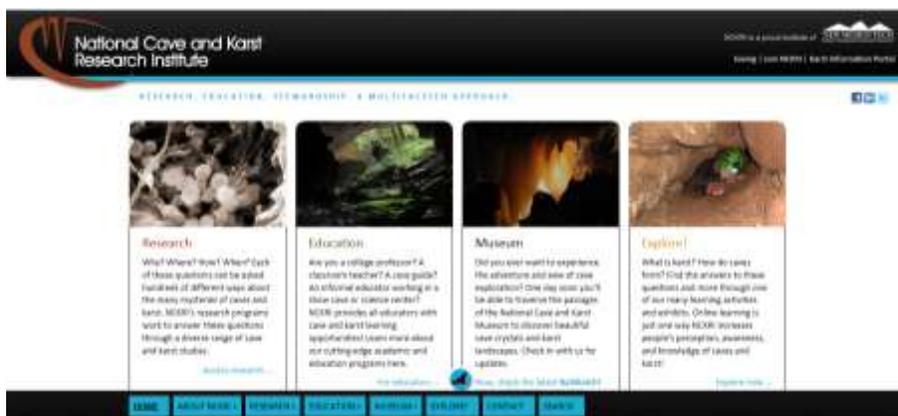
Website: nckri.org New Appearance - New Approach.

You told us we needed a new website and we listened. Over the past few months, we have worked on a major overhaul of NCKRI's website. The new website is designed to give a user-friendly experience with engaging content. Appearance is the most notable change (draft version below), but the most significant change is in our approach. The new nckri.org expands our ability to educate the public about the fragility and importance of caves and karst environments and their related resources. The primary objective of the new NCKRI website is to provide an effective outreach and communication tool that will inspire our audience to learn about caves and karst and to support NCKRI's multifaceted approach in protecting them.

Our new website design features a clean layout with simplified navigation to allow users to quickly find the content they are looking for. You will be able to click easily and smoothly through our pages to find information on NCKRI projects, programs, opportunities, and staff. Through the added "museum" section, you can investigate NCKRI's bat roost and help us keep "bat watch" as we await the arrival of our first furry residents.

The new nckri.org is dynamic and ever changing; we like to think of it as an active educational tool. Over the next few months, we will add new content and developing more features. We invite you to virtually explore the mysteries of caves and karst with us at www.nckri.org.

Ever wonder what NCKRI is up to? For quick information and updates, you can now follow us on Twitter and find us on Facebook!



Cave and Karst Studies Program at NMT

Cave and Karst Studies at New Mexico Tech (NMT) is NCKRI's academic program and taught through NMT's Earth and Environmental Sciences Department. A variety of regular courses and special topics are taught by Dr. Penelope Boston on a rotating 2-year frequency, several in collaboration with other faculty (Dr. Tom Kieft, Biology, Dr. Kent Condie and Dr. John Wilson in Earth and Environmental Science) including:

- Cave and Karst Systems
- Cave and Karst Laboratory
- Advanced Topics in Speleohydrology
- Karst Tufa Spring Mound Research
- Model Impact Energetics of Earth and Mars
- Moonmilk Research
- Research Experience on Cave Pearl Origins
- Fundamentals of Geobiology
- Survey of Geomicrobiology
- Frontiers of Geobiology and Geomicrobiology
- Astrobiology
- Extraterrestrial Dissolutional Landforms
- Astrogeology: Mars and Beyond
- Spaceship Earth: Integrated Global Planetary Science

Dr. Boston currently supervises one Ph.D. student, two Master's students, two undergraduate senior theses, and four independent studies.

During the 2010-2011 year, researchers and students of the Cave and Karst Studies program have engaged in excellent and exciting research, continuing ongoing projects and beginning a new study of climate signals contained in cave sediments. With extensive grant submission activities and laboratory supervision by Dr. Rasima Bakhtiyarova, the program has set a very high academic and research standard at NMT.



Student Projects

Sulfuric Acid Caves and Sulfur Springs of Tabasco, Mexico

Laura Rosales Lagarde, PhD Candidate, Geology, has submitted one paper and has two more papers in preparation on the origins of the hydrogen sulfide and other gases and waters flowing into Cueva de Villa Luz and other sulfur caves and springs in the region of southern Tabasco, Mexico. She anticipates defense of her dissertation in fall 2011.

Groundwater of the Salt Basin

Sophie Sigstedt, MS Student, Hydrology, defended her MS thesis, *Environmental Tracers in Groundwater of the Salt Basin, New Mexico, and Implications for Water Resources*, in July 2010.

Andre Richie, MS Student, Hydrology, defended his thesis, *Hydrogeologic framework and development of a 3-D groundwater flow model of the Salt Basin, New Mexico and Texas*, in February of 2011 and is currently working as a consultant at AMEC Consultants in Socorro, NM.

Ice Caves in Antarctica

Aaron Curtis, MS Student, Geology, continues to analyze ice samples from Antarctica obtained during the previous two field seasons as part of his work on the physical and biological dynamics of fumarolic ice caves and towers on Erebus Volcano. He will be returning to Antarctica for a third field season in November of 2011. He has submitted two manu-

scripts to journals, one in collaboration with NCKRI Scholar Laura Rosales-Lagarde.

Fort Stanton Cave

Kristina Daisy Morgan, MS Student, Hydrology, is working on the hydrological and climate history of Fort Stanton Cave's Snowy River Passage, analyzing the highly structured mud deposits in Mud Turtle Crawl, the main passages, and in Snowy River itself. She is developing pioneering techniques never before applied to caves, to look at dateable materials and clues to above-ground vegetation (pollen, plant crystals known as phytoliths, and diatom algae).

Bureau of Land Management Cave Assistance Agreement

The Fort Stanton Cave Snowy River Passage project continues in spite of White-nose Syndrome fears and current closure of the cave. Samples collected in previous years are undergoing analysis by Dr. Boston, NCKRI Scholar Daisy Morgan, and collaborators at UNM and elsewhere.



Photo by Nial Peters, courtesy of Aaron Curtis
Aaron Curtis in an ice cave, Antarctica.

Student Support at Other Universities

NCKRI's broader educational outreach efforts extend to universities outside of New Mexico Tech. General support through information is provided to many students. Formal support is currently provided by Executive Director Dr. George Veni, who served this year on the committee of one student at The University of Texas at San Antonio (UTSA), and one student at Harokopio University, Athens, Greece. Their projects are summarized below.

Thermal Imaging of Caves

Keith Muhlestein successfully defended his dissertation proposal to conduct thermal imaging studies of caves and karst features. His hope is to develop the technology for reliable application in environmental assessments of karst areas. To expand his skill set and range of experience, Keith volunteered to work on a week-long cave thermal imaging study in the Mojave Desert in April 2011.

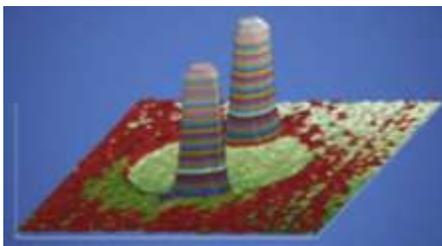


Image courtesy of Keith Muhlestein

Thermal image of laboratory proof-of-concept study simulating heat flow through cave-like structures.

GIS Evaluation of a Limestone and Gypsum Karst Area, Greece

Miljana Golubović Deligianni defended her Ph.D. dissertation on geographic information system (GIS) modeling of the karst geomorphology and land use in the Ksirimero region of western Greece. Her study area has limestone mountains surrounding gypsum plains and hills dotted with alluvium-filled sinkholes and poljes (large, flat-floored sinkholes). She has published six papers on her work; another is due in fall 2011.

OUTREACH

Professional Partnerships *AGI Membership!*



NCKRI became the 48th Member Society of the American Geological Institute (AGI) in February 2011. AGI is a non-profit federation of 49 geoscientific and professional associations that represents more than 120,000 geologists, geophysicists and other earth scientists. Founded in 1948, AGI provides information services to geoscientists, serves as a voice of shared interests in the profession, plays a major role in strengthening geoscience education, and increases public awareness on how the geosciences play crucial roles in society's use of resources, resiliency to natural hazards, and interaction with the environment. AGI membership will be integral to fulfilling NCKRI's mission in educating the public, policymakers, and the geoscience community about how karst functions, and the resources and challenges it presents.

International Union of Speleology Affiliation

NCKRI has become the first Affiliated Organization of the International Union of Speleology (UIS). During the UIS' Bureau meeting in Jedovnice, Czech Republic, in April 2011, the Bureau voted unanimously to accept NCKRI. The UIS and NCKRI are already working in partnership on the Karst Information Portal and the *International Journal of Speleology*, so this affiliation formalizes an already firm and strengthening relationship. The UIS is in essence the United Nations of cave organizations, with 60 members nations united to advance cave exploration and study.

Professional Meetings

NCKRI attended, sponsored, and/or had a booth at many conferences during the past year:

- 6th Congress of the Federation of Latin American and Caribbean Speleological Associations and 70th Anniversary of the Cuban Speleological Society; Matanzas, Cuba.
- 12th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst; St. Louis, Missouri.
- 2011 International Conference on Karst Hydrogeology and Ecosystems; Bowling Green, Kentucky.
- Geological Society of America Convention; Denver, Colorado.
- National Speleological Society Convention; Essex, Vermont.
- National Speleological Society Board of Governors Meeting; Albuquerque, New Mexico.
- U.S. Geological Survey Karst Interest Group Workshop; Fayetteville, Arkansas.

The first public event at NCKRI Headquarters occurred on March 21-25, 2011 when NCKRI hosted the Bureau of Land Management's *Cave and Karst Resources Management Workshop*. Additionally, NCKRI staff organized or co-organized the following events:

Dr. Land:

- Co-chaired a technical session at the 2011 International Conference on Karst Hydrogeology and Ecosystems, and gave two presentations on the Eddy County sinkholes and geophysical investigations at Fort Stanton Cave, New Mexico.
- Co-chaired a technical session on engineering geology and evaporite karst at the 2010 Geological Society of America Convention.

Dr. Veni:

- Moderated a discussion on international karst research cooperation at the 2011 International Conference on Karst Hydrogeology and Eco-

NCKRI Given Management of the Sinkhole Conference

The *Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst*, generally called “the Sinkhole Conference,” is now under NCKRI’s management. Since 1984, this highly respected international conference series has been instrumental in bringing together geoscientists and engineers to better prevent and fix many of the land use challenges that occur in karst areas. The Sinkhole Conference’s Organizing Committee unanimously agreed to turn over its management to NCKRI. NCKRI is keeping the Organizing Committee intact and continues to expand that team with more excellent karst engineers and geologists, as well as NCKRI staff. The 13th Sinkhole Conference will be held on May 6-10, 2013 in Carlsbad, New Mexico. This venue will be the furthest west for the conference, which has visited 11 other cities throughout the eastern and central United States. There is already discussion of possibly taking future meetings to other countries.



Photo by George Veni

Engineers and geoscientists learn about underground limestone quarries in Illinois during the field trip for the 12th Sinkhole Conference, January 11, 2011.

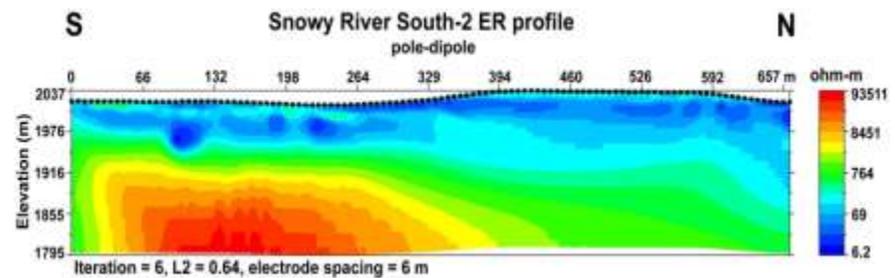
systems.

- Co-chaired the 12th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst; Dr. Land chaired its *Sinkhole Mitigation and Repair* session. NCKRI also sponsored:
- The 3D photography exhibit, *Underground of Enchantment*, at the Carlsbad Museum and Art Center, which will begin traveling outside of New Mexico next year.

Guest Lectures by NCKRI

Drs. Boston, Land, and Veni and Ms. Gillespie were invited to give the following presentations and lectures:

- *Organisms from the Depths of the Earth to the Depths of Time: The Geological Legacy of Metabolism* at the National Research Council Bioinspired Energy Workshop in January 2011.
- *Planetary Protection on Mars Sample Return Mission* at the NASA Planetary Protection Subcommittee Meeting in November 2010.
- R.A.F. Penrose Lecture *The Planet Within* at the April 2011 meeting of the American Philosophical Society, Philadelphia, Pennsylvania, in honor of Nobel Laureate Dr. Baruch Blumberg.
- *Caves on Earth, Mars and Beyond* to the CalTech Summer Science Program which is jointly held each summer at NMT and Westmont College (Santa Barbara, California). This program targets groups of exceptional high school students at the junior/senior level and Dr. Boston has presented to them for seven consecutive years.
- *Microbial ecosystems at depth: Contrasts in nutrient and other environmental gradients between natural caves and ultra-deep mines*, New Mexico Geological Society Spring Meeting, April 2011, Socorro, New Mexico.
- *The Near Subsurface Habitat of Mars: Caves, Vugs, & Drilling* at the International Mars Habitability Conference in Lisbon, Portugal in mid-June 2011.
- *The results of deliberations on the E-2-E Mars Sample Return Science Definition Team (Joint NASA/ESA working group) in Lisbon, Portugal* at the meeting of the Mars Exploration Program Analysis Group.
- *Recent geophysical investigations at Fort Stanton Cave*, at the Pecos Valley Grotto of the National Speleological Society in Carlsbad, New Mexico.
- *Results of hydrological research by NCKRI personnel at Fort Stanton Cave* to the Carlsbad Rotary Club, November 2010.
- *Discoveries in the Snowy River Passage of Fort Stanton Cave* to the Artesia chapter of the Desk and Derrick Club.
- *Artesian groundwater resources in karstic aquifers of the Pecos Valley region of New Mexico*, to the Pecos Valley Grotto of the National Speleological Society, Carlsbad, and at the Enchanted Evenings educational event at Bottomless Lakes State Park, Roswell, New Mexico, June 2011.
- *Cave and karst research institutes, FEALC, and the UIS: directions of growth for partnerships and success*, keynote lecture by Dr. Veni for the 6th Congress of the Federation of Latin American and Caribbean Speleological Associations, Matanzas, Cuba, August 2010.
- *Hydrogeologic controls on the evolution of the Edwards Plateau Karst, Texas, USA* to the Winter Technical Meeting of the Southwest Regional of the National Speleological Society, December 2010.
- *Introduction to NCKRI’s artificial bat roost* for the joint Bat Conservation International - US Forest Service Bat Workshop.



SRS-2 resistivity profile over projected southwest extension of the Snowy River Passage of Fort Stanton Cave. High resistivity anomaly represented by bright red and orange colors indicates the probable location the passage.

Distinguished Lecture Series

NCKRI's Distinguished Lecture Series now has a new home at NCKRI Headquarters. The first of these lectures were given during NCKRI's Opening Day Celebration with presentations from:

- Dr. Jack Hess, Executive Director of the Geological Society of America, *Introduction to Caves and Karst*.
- Debbie Buecher, Wildlife Biologist, Buecher Biological Consulting, *Bats: Masters of the Night Sky and Meet a Live Bat!*
- Geary Schindel, Chief Technical Officer of the Edwards Aquifer Authority, *It's Not Easy Being Karst*.
- Dr. Penelope Boston, Geomicrobiologist and Academic Director of NCKRI, *The Planet Under Our Feet: From Giant Crystals to Rock-eating Microbes*.



Photo by George Veni

Millions of bats take flight every evening for about half the year in the US, providing tremendous services such as insect control and pollination.



Photo by George Veni

NCKRI board member Geary Schindel pours dye into tubing that flows into a cave in order to better understand complex groundwater flow in the karstic Edwards Aquifer, Texas.

Co-Sponsored Speakers

NCKRI co-sponsors the Edwards Aquifer Authority's Distinguished Lecture Series in San Antonio, Texas. During the period of this annual report, Dr. Ralph Ewers spoke on *Understanding Karst Characteristics and the Transport and Storage of Contaminants Within Them* in September 2010, and was followed in April 2011 by Dr. John Mylroie who presented the seminar, *The Spectrum of Karst: Rock, Climate, and Hydrology as Cave Controls*.

National Involvement

- NCKRI is a recognized sponsor for the United Nations Environment Programme's *Year of the Bat*, as well as being the North American Contact.
- Dianne Gillespie, NCKRI's Education Director, serves on the National WNS Communications and Outreach Working Group. This committee consists mainly of governmental agency representatives. However, for balanced perspective, non-profit informal educators have been invited to take part. The work-

ing group completed a review and revision of the *Battle for Bats* brochure and an article for the *NSS News*. This committee developed outreach programs and materials for the National Speleological Society's 2011 Convention in Greenwood Springs, Colorado.

Community Involvement

Beginning in March 2011, NCKRI now hosts the monthly meetings of the Pecos Valley Grotto of the National Speleological Society on the third Thursday of each month at 7 pm. Anyone interested in caves, cave exploration, cave research, or any other cave related topic is welcome to attend.

Dianne Gillespie developed a presentation targeting a young audience at the Carlsbad Library as a part of their water education week. Participants explored an artificial cave, listened to stories about caves, and learned about karst and the water cycle.

NCKRI Staff:

- Participated in the Carlsbad Chamber of Commerce's annual *Bat Bri-*



Photo by George Veni

Dianne Gillespie uses a model to demonstrate how groundwater that moves through karst aquifers flows far faster and through much more complex flow paths, and has far greater vulnerability to contamination than groundwater in non-karst aquifers.

gade. This delegation of community leaders visits leaders of New Mexico government at the state capitol in Santa Fe to raise their awareness and support for issues in the City of Carlsbad and Eddy County.

- Celebrated our fourth year of partnership with the Bureau of Land Management, National Park Service, and National Forest Service in *Relay for Life*, a nationwide campaign to raise awareness and funds to fight cancer.
- Regularly attended meetings of the Carlsbad Chamber of Commerce, Carlsbad Department of Development, and Carlsbad Rotary Club, and participated in related activities supporting new businesses and community leaders.
- Participated in the annual Carlsbad Chamber of Commerce Business Fair.
- Promoted and supported the development of the *Underground of Enchantment*, a 3D photography exhibit featuring Lechuguilla Cave, at the Carlsbad Museum and Art Center.

Media

Dr. Penelope Boston:

- Starred in *Return to the Giant Crystal Caves*, the much anticipated National Geographic sequel to the *Giant Crystal Cave*, that aired in the US and Canada in October and December 2010. This production revisited the Naica Cave in Chihuahua, Mexico, showed a newly discovered cave in the area, and presented new information about the microbiology of this unique cave system.
- Taped a television special with Phil Platt *Bad Universe* highlighting Dr. Boston's work with extremeophiles in Spider Cave, Carlsbad Caverns National Park, New Mexico. Broadcast on the Discovery Channel in August and September 2010.
- Advised on scientific issues and participated in 3D filming of fieldwork and interviews with the team that developed a new exhibit on origins and early evolution of life, *Emergence: A New View of Life's Origin*, at the New Mexico Museum of Natural History and Science. The new exhibit officially

opened on June 30, 2011.

Dianne Gillespie:

- Recorded in a 30-second spot at KOBR Roswell, New Mexico, to raise awareness of NCKRI's Opening Day Celebration.
- Along with Dr. George Veni, was recorded in a special report for the KOCT-TV Carlsbad Community Channel to raise awareness of NCKRI and its Opening Day Celebration.

Dr. George Veni:

- Gave New Mexico radio interviews on the opening of NCKRI Headquarters to the Mike Jaxson Show, PVBX Radio, Artesia; Frank Niemeyer Show, Carlsbad Radio KATK and KCDY, Carlsbad; and the Bob Scholl Show, Radio Station KCCC, Carlsbad.
- Provided several Carlsbad area newspaper interviews on the construction and opening of NCKRI Headquarters.
- Was interviewed by the Canadian press about a hotel explosion in Quintana Roo, Mexico, that could have been related to explosive gases in an underlying cave.



Photo courtesy of Penny Boston

Dr. Penny Boston prepares a crystal sample from the Naica caves for analysis.

BOARD ACTIVITIES

The NCKRI Board of Directors awarded its first awards to two outstanding volunteers: Dr. Patricia Seiser and Dr. Kevin Stafford (see page 5).

The Board met in Lakewood, Colorado in November 2010, and in Carlsbad, New Mexico, in May 2011, following NCKRI's Opening Day Celebration. The May meeting was preceded by a strategic planning retreat for the Board and staff where NCKRI's progress was reviewed and NCKRI's plans were examined and better defined. In addition to Board meetings, the Executive Committee met via telephone monthly, and several meetings of the entire board were held electronically and over the telephone.

Two directors retired from the Board this year—Ronald Kerbo (National Park Service, retired) and David Kampwerth (US Fish and Wildlife Service). Their positions will be filled before the October 2011 meeting.

Actions of the Board

- Hired Ann Dowdy as the Advancement Director.
- Approved a purchasing policy.
- Affiliated with the American Geological Institute in February 2011.
- Held a one day strategic retreat in May 2011.
- Accepted the Education Director's Strategic Education Plan.
- Approved an Applied Science and Management Agenda prepared by the Board committee.
- Approved NCKRI sponsorship of the Karst Waters Institute meeting *Carbonate Chemistry: Reactions and Processes in Aquifers and Reservoirs*, to be held in August 2011, and sponsorship of the National Cave and Karst Management Symposium, to be held in October 2011.

Hazel Medville, Chairman

Member since 2005, Chairman since 2006, Bachelor's Degree in Statistics and Computer Science. Hazel is a retired Computer Engineer/Manager who now spends much of her time surveying caves in Hawaii and Colorado. She was the President Pro-Tem and Government Liaison for the National Speleological Society, the Technical Program Chairman for the 15th International Congress of Speleology, and is currently the Director of the West Virginia and Hawaii Speleological Surveys. In 2003, Hazel was honored to receive the William J. Stephenson Outstanding Service Award from the National Speleological Society in recognition of her long term contributions to the society.

Dale Pate, Vice-Chairman

Member from 2000-2002; 2006 to present, and Vice-Chairman since 2006. Bachelor's Degree in Geography. Dale has been the National Park Service Acting Cave and Karst Program Coordinator since May 2007, and the Supervisory Physical Scientist (Cave Specialist) at Carlsbad Cavern National Park since July 1991.

BOARD OF DIRECTORS

Richard Cervantes, Secretary/Treasurer

Member since 2005; permanent position representing New Mexico Tech. (NMT) Master's Degree in Accounting and Information Systems, and is also a CPA. Richard is NMT's Associate Vice President of Research and Economic Development. He is responsible for administrative affairs including budget preparation, fiscal and project management, proposal development and contract negotiation.

Dr. Harry Burgess

Member since 2005; permanent position appointed by the Mayor of Carlsbad, New Mexico; Bachelor's Degree in Industrial Relations, Master's Degree in Fire and Emergency Management Administration; Master's of Business Administration; Ph.D. in Economic Development. Harry represents the City of Carlsbad's participation with NCKRI. He is the City Administrator but also has an extensive caving background, having worked previously with the National Park Service at Carlsbad Caverns and served on the Board of the National Cave Rescue Commission. He also taught caving for the National Outdoor Leadership School.



NCKRI Board and staff at the entrance of NCKRI Headquarters.

Photo courtesy of Mike Spilde

Dave Steensen

Member since January 2009; permanent position representing the National Park Service (NPS); Bachelor's Degree in Geology, Master's Degree in Environmental Systems/Applied Geology. Dave is the NPS Geologic Resources Division Chief. One of his responsibilities is oversight and support of the Service-wide cave and karst resource management program.

*Dr. John (Jack) Hess,
Member at Large*

Member since 2005; Member at Large of the Executive Committee; Ph.D. in Geology. He is the Executive Director of the Geological Society of America (GSA). Prior to joining GSA in 2001, he was Executive Director of the Division of Hydrologic Sciences and Vice President for Academic Affairs at the Desert Research Institute in Nevada. He serves on the boards of the Karst Waters Institute and Longs Peak Council of the Boy Scouts of America, as well as NCKRI. He is a Fellow of GSA, the National Speleological Society, and the Cave Research Foundation.

Dr. Robert Brinkmann

Member since May 2010; Bachelor's and Master's degrees in Geology, Ph.D. in Geography. He recently left the University of South Florida to become the Director of Sustainability Studies at Hofstra University and the Director Sustainability Research at the National center for Suburban Studies. Bob works on many karst issues, particular karst policy, urban karst, environmental sustainability, and geomorphology.

Todd Chavez

Member since 2009; Master's Degree in Library and Information Science. Director of Academic Resources at the University of South Florida Tampa Library, Todd's research focuses on understanding scholarship in the sciences including the tools and processes underlying its creation, organization, discovery, communication, and preservation. Activities in-

clude building non-traditional library collections to support scientific research and publication, and applying bibliometric research methods to document and "visualize" scholarship in the sciences. He is the Operations Manager and a founding partner of the Karst Information Portal.

Dr. Ronald T. Green

Member since 2007; Bachelor's in Industrial Engineering; Bachelor's in Geology; Master's in Geophysics; Ph.D. in Hydrology. Ron is a hydrogeologist with the Southwest Research Institute, San Antonio, Texas, where much of his work focuses on karst aquifers.

Jim Goodbar

Charter board member; Bachelor's Degree in Park and Recreation Management; graduate studies in cave and karst resources, geology, and geomorphology. Jim works in Carlsbad for the US Bureau of Land Management (BLM) as the Senior Cave and Karst Resources Specialist with the Washington Office. He serves as BLM New Mexico State Cave Coordinator and Senior Cave and Karst Specialist for the BLM Pecos District and the Carlsbad Office. His primary responsibilities: establish policy and provide guidance on cave/karst resource management to all BLM offices, serve as the international point of contact for all cave/karst related issues and requests for assistance, develop and conduct training for cave/karst resources, and develop best management practices for land use in karst.

David Kampwerth

Member since May 2010; Bachelor's Degree in Fishery Biology, and graduate work in karst ecology, geology, and hydrology. He has worked for the Colorado Division of Wildlife, Wyoming Game and Fish Commission, US Bureau of Land Management, and is currently with the US Fish and Wildlife Service. David has taught national cave and karst management and underground abandoned mine courses, characterized karst and

abandoned mines, and written policies regarding karst/mine resources. He has 35 years of caving experience, 31 years underground abandoned mine experience and education, and 20 years of professional karst conservation education and experience.

Ronal Kerbo

Member since June 2009, Cave and Karst Resources Specialist for the US National Park Service (NPS) for 31 years until March 2007. Ron retired from the NPS as the National Cave and Karst Program Coordinator and the acting Director of NCKRI.

Jesse Richardson

Member since May 2010; Bachelor's and Master's Degrees in Agricultural and Applied Economics from Virginia Tech; Juris Doctor from the University of Virginia School of Law; Jesse is an Associate Professor in Urban Affairs and Planning at Virginia Tech and a practicing attorney.

Geary Schindel

Member since 2004; Bachelor's Degree in Geology and a Master's Degree in Geography. Geary is the Chief Technical Officer of the Edwards Aquifer Authority in San Antonio, Texas, and directs the Aquifer Science Research Program. The Edwards Aquifer is a major karst aquifer that provides water to more than 1.7 million people in south-central Texas.

David Weary

Member since June 2009, Bachelor's Degree in Geology from George Mason University, Master's in Geology from Virginia Tech. He has worked for the US Geological Survey (USGS) in Reston, Virginia, since 1988; represents USGS on the NCKRI Board. A research geologist, he is Chief of the USGS KARST Project, which includes hydrogeologic studies and geologic mapping in the Missouri Ozarks and Shenandoah Valley of the Virginias, and work on the new national karst map in cooperation with NCKRI and the National Speleological Society.

NCKRI STAFF



Photo courtesy of Paula Bauer

(L-R) Dianne Gillespie, Lewis Land, Ann Dowdy, Debbie Herr, and George Veni touring Carlsbad Cavern.

Dr. George Veni, Executive Director

Dr. Veni is an internationally recognized cave and karst hydrogeologist. Prior to NCKRI, he owned and served as principal investigator of George Veni and Associates for more than 20 years. He has conducted extensive karst research throughout the United States and in several other countries. His administrative work includes serving as the Executive Secretary of the National Speleological Society's Section of Cave Geology and Geography for 11 years, President of the Texas Speleological Survey for 13 years, Adjunct Secretary of the International Union of Speleology (UIS) from 2002-2009, and UIS Vice President of Administration since 2009. He has served as a committee member of geological, geographical, and biological dissertations at The University of Texas and Harokopio University (Greece), and taught karst geosciences courses for Western Kentucky University for 12 years. He has published and presented over 180 papers and five books, on hydrogeology, biology, and environmental management in karst.

Ann Dowdy, Advancement Director

Ms. Dowdy joined NCKRI in October 2010 and brings an impressive background in fundraising. She has a Bachelor of Arts in Organizational Communication, St. Edward's University, Austin, Texas, and a 2010 Certification in Non-profit Leadership and Management from the Texas Association of Non-profit Organizations.

Ms. Dowdy is a 28 year veteran in the fundraising and marketing profession. With a broad career in this field she has worked at an art museum, science museum, crisis center, private school and private foundation, and a national nonprofit before coming to NCKRI. Ms. Dowdy was part of a team of museum professionals that built the Museum of Science & Industry (MOSI) in Tampa, Florida. MOSI is the 5th largest science museum in the United States. A campaign goal of \$37 million was raised to expand the museum to 250,000 square feet that included an IMAX Theatre. MOSI's membership reached an all time high of 20,000. MOSI grew from a regional science center to a nationally recognized sci-

ence center and now serves around 700,000 visitors a year.

Ms. Dowdy is a member of national level organizations such as the American Association of Museums (AAM), where she serves as an AAM Peer Reviewer, and the International Association of Fundraising Professionals/New Mexico Chapter. She is also a member of the Texas Association of Non-profits, The Texas Museum Association, Museum Store Association, the Tourism Association of New Mexico, Carlsbad Chamber of Commerce, and the Carlsbad Rotary Club.

Dianne Gillespie, Education Director

Ms. Gillespie began working for NCKRI in June 2009 and brings with her a wealth of teaching experience, both formal and informal. While most of this experience has been gained in Kentucky and Tennessee classrooms teaching at many levels, she has also conducted and assisted with cave and karst education programs with the National Park Service, American Cave Conservation Association, and Western Kentucky University, among others. Ms. Gillespie holds a Master's Degree in Education, with a focus on science and history. Since 2009, she has served as the Education Division Chief of the National Speleological Society. She is an active and experienced cave explorer and surveyor on multiple and diverse projects.

Ms. Gillespie brings a broad and creative set of talents to NCKRI, with a Bachelor's Degree in Theatre, and through a decade of theatrical and television production experiences with Kentucky Educational Television, the state of Florida, Discovery Channel, and more. Since joining NCKRI, she now serves on education and cave and karst management committees for Carlsbad Municipal Schools and the US Forest Service, and conducts cave and karst education programs nationally.

**Debbie Herr,
Administrative Coordinator**

Debbie joined NCKRI in January 2008 to organize and lead its administrative activities after working as a secretary in the Truth or Consequences Municipal School District for 11½ years. She received an Associate's Degree in Secretarial Administration from New Mexico State University at Carlsbad, and has over 20 years experience as a secretary and administrative assistant. Debbie works as interim publisher for NCKRI, producing the annual report series and other materials. She is also a piano accompanist, having worked with many high school students, several churches, a community chorus, and many soloists, both vocal and instrumental.

**Dr. Lewis A. Land,
Karst Hydrologist**

Dr. Land is a karst hydrogeologist with the New Mexico Bureau of Geology & Mineral Resources (NMBGMR). He serves as the Bureau's liaison with NCKRI and as NCKRI's lead geophysical investigator. Prior to his career as a hydrogeologist, Dr. Land spent eight years in the petroleum industry exploring for new oil reserves in the Mid-Continent and Rocky Mountain regions of the U.S., and offshore West Africa. He received his Ph.D. from the University of North Carolina-Chapel Hill, where his doctoral research included submersible investigations of submarine sinkholes in the Straits of Florida. Before coming to work for NCKRI and NMBGMR in 2002, Dr. Land spent two years with the North Carolina Division of Water Resources conducting geophysical surveys of aquifers beneath the coastal plain of North Carolina.

Dr. Land's current research focuses on regional investigations of karstic aquifers and associated phenomena in southern New Mexico. He has served on several graduate student committees at New Mexico Tech (NMT), and is an adjunct faculty member in the NMT Department of Earth and Environmental Sciences. He is a Past-President of the New Mexico Geological Society (NMGS), and served for five years on the NMGS Executive Committee.



Photo courtesy of Val Hildreth-Werker

**Dr. Penelope Boston,
Academic Director**

Dr. Boston teaches classes in cave and karst science, geomicrobiology, astrobiology, and global systems, and supervises graduate students studying those topics at New Mexico Tech. She received a National Research Council Postdoctoral Fellowship at NASA-Langley Research Center, has held positions at the National Center for Atmospheric Research, the University of Colorado, University of New Mexico, and founded/operated her own non-profit research institute (Complex Systems Research Inc.) for 14 years before joining NCKRI in 2002. She is a Fellow of the NASA Institute for Advanced Concepts, Past President of the Association of Mars Explorers, Senior Editor of *Astrobiology*, member of the NASA Advisory Council Committee on Planetary Protection, member of the National Academy of Sciences COMPLEX committee, and past advisory board member for the *Journal of Cave & Karst Studies*.



**Lisa Majkowski,
Cave & Karst Studies
Program Liaison**

Lisa works for the New Mexico Tech Earth and Environmental Science Department as the Earth Systems Specialist, and worked as the Cave and Karst Studies Program Liaison with NCKRI until January 2011. Lisa received her Bachelor's and Master's of Science degrees in geology from New Mexico Tech. Focus areas included grant budget management, technical meeting development, proposal management, national conference exhibiting, scientific and technical reporting, and geographic information systems (GIS).

In addition to her role with NCKRI, Lisa was also the program manager for several other large projects including the CRONUS-Earth Project, the New Mexico-EPSCoR Undergraduate Research Opportunities Program (REU), the Chemistry Interdisciplinary Science for the Environment REU Program, and the NASA instrument project: New Mexico Exoplanet Spectrographic Survey Instrument.

Lisa has conducted fieldwork to model the neo-tectonic evolution of the Owens Valley in California. She also worked on an REU project which focused on using GIS techniques to understand the spatial distribution and temporal changes of the Mora Valley, New Mexico, acequia (irrigation canal) system.

In February 2011, Lisa had to leave the NCKRI team. Lisa was an outstanding staff member, and we wish her well as she advances her career.

Continuing Staff Education

NCKRI staff polish and expand their skills whenever possible. Formal training attended by one or more staff members in the past year includes:

- *The Application of Geophysics in Karst and Applied Karst Hydrogeology with Emphasis on Dye Tracing and Groundwater Monitoring*, both taught at the 12th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst.
- *Understanding Karst Characteristics and the Transport and Storage of Contaminants Within Them* through the Edwards Aquifer Authority's Distinguished Lecture Series.
- *Strictly Business: The Dale Carnegie Immersion Seminar*.
- *Leadership Carlsbad* - This program, through the Rotary Club and Carlsbad Chamber of Commerce, has been great for increasing the visibility of NCKRI and for establishing local contacts and potential

partners. The Leadership Carlsbad program participants are required to establish a community project. Dianne Gillespie's group developed a wiki site to promote eco-tourism for the region. Dianne spent a considerable amount of time from December 2010 to April 2011 in co-developing the website plan, marketing materials, and web content.

- *BCI - Forest Service Workshop* included three days of classroom time, two evenings of field work, and a tour of Carlsbad Caverns. Part of the classroom lessons focused on the importance of artificial bat habitats, such as NCKRI's.
- *Build Your Internet Identity*, by the Carlsbad Department of Development, offered helpful tips and tools on reaching online shoppers, creating a web presence, and productively marketing products and services. Topics included how to get your company noticed on the web, expanding your reach for finding new customers and creating an online presence.
- *Reach Online Shoppers with or without a Website*, given by the Carlsbad Department of Development, offered ideas and strategies to teach how to develop web presence, how to get your company noticed, and how to promote your products and services.
- *Cave and Karst Management*. This intensive introduction to cave management practices was presented by the Bureau of Land Management at NCKRI Headquarters. Designed for state and federal land managers, this course covered topics that included the Federal Cave Resources Protection Act, significant cave identification, cave inventories and monitoring, and White-nose Syndrome, presented in classroom and field settings.

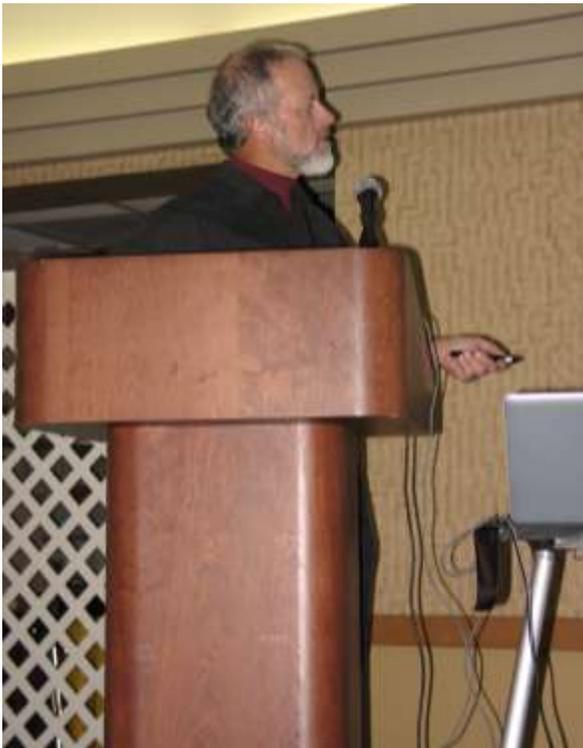


Photo by George Veni

Dr. Lewis Land gives a lecture during the 12th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst in St. Louis, Missouri.

STAFF PUBLICATIONS

Refereed

Journal Papers

Boston, P.J. 2010. INVITED PAPER.

Location, Location, Location! Lava caves on Mars for habitat, resources, and science. *Journal of Cosmology* 12:3957-3979 special issue on Mars missions and exploration.

McKay, C.P., Schulze-Makuch, D., Boston, P.J., ten Kate, I.L., Davila, A.F., and Shock, E. 2011. *Astrobiology*. January/February, 11(1): 2-8. doi:10.1089/ast.2010.1122.

Northup, D.E., Melim, L.A., Spilde, M.N., Hathaway, J.J.M., Garcia, M.G., Moya, M., Stone, F.D., Boston, P.J., Dapkevicius, M.L.N.E., and Riquelme, C. 2011. Lava Cave Microbial Communities Within Mats and Secondary Mineral Deposits: Implications for Life Detection on Other Planets. *Astrobiology*. AST-2010-0562.R2.

Northup, D.E., Snider, J.R., Spilde, M.N., Porter, M.L. van de Kamp, J.L., Boston, P.J., and Nyberg, A.M. 2010. Diversity of rock varnish bacterial communities from Black Canyon, New Mexico. *Journal of Geophysical Research - Biogeoscience*. 115:G02007.

Conference Proceedings Papers

Land, L. 2011. Geophysical records of anthropogenic sinkhole formation in the Delaware Basin region, southeast New Mexico and west Texas, USA. *Proceedings of the Twelfth Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst*, St. Louis, Missouri (proceedings in press).

Land, L. 2011. Geophysical prospecting for new cave passages: Fort Stanton Cave, New Mexico, USA. *Proceedings of the Twelfth Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst*, St. Louis, Missouri (proceedings in press).

Veni, George. 2011. National Cave and Karst Research Institute: growing capabilities and federal partnerships. *U.S. Geological Survey Karst Interest Group Workshop, Fayetteville, Arkansas, April 26-29, 2011, Scientific Investigation Report 2011-5031*: 113-117.

Veni, George. 2011. The National Cave and Karst Research Institute: a new home for the Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst. *Program with Abstracts, 12th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst*. St. Louis, Missouri, 26 (proceedings in press).

Veni, George, Miljana Golubović Deligianni, and Kosmas Pavlopoulos. 2011. Land use and limitations in the sinkhole and polje karst of the Ksiriomero Region, western Greece. *Program with Abstracts, 12th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst*. St. Louis, Missouri, 23-24 (proceedings in press).

Books and Book Chapters

Johnson, Steve, Schindel, Geary, and Veni, George. 2010. Tracing groundwater flowpaths in the Edwards Aquifer Recharge Zone, Panther Springs Creek Basin, northern Bexar County, Texas. *Edwards Aquifer Authority Report* No. 10-01: 112.

Land, Lewis, and George Veni. 2011. Electrical resistivity survey: I&W brine well, Eddy County, New Mexico. *Report of Investigations 2*, National Cave and Karst Research Institute: 14..

Unrefereed Papers

Gary, Marcus, Shade, Beverly, Gary, Robin, and Veni, George. 2010. Spatial and temporal recharge variability related to groundwater interconnection of the Edwards and Trinity Aquifers, Camp Bullis, Bexar and Comal counties, Texas. *Geological Society of America Convention*. Denver, Colorado (on CD).

Johnson, Steve, Schindel, Geary, and Veni, George. 2010. Tracing groundwater flowpaths in the Edwards Aquifer Recharge Zone, Panther Springs Creek Basin, northern Bexar County, Texas. *Bulletin of the South Texas Geological Society*, 51(3): 15-46.

Land, Lewis A. 2010. Geophysical characterization of anthropogenic sinkholes in the Delaware Basin region, southeast New Mexico and west Texas. *Geological Society of America Convention*. Denver, Colorado (on CD).

Land, Lewis, and Veni, George. 2011. Geophysical investigations of anthropogenic karst phenomena in southeastern New Mexico. *Proceedings, 2011 International Conference on Karst Hydrogeology and Ecosystems*. Bowling Green, Kentucky, 98-99.

Veni, George. 2010. Cave and karst research institutes, FEALC, and the UIS: directions of growth for partnerships and success. **Keynote Address, Program General y Científico, 6th Congress of the Federation of Latin American and Caribbean Speleological Associations and 70th Anniversary of the Cuban Speleological Society**. Matanzas, Cuba, 3.



Photo by George Veni

NCKRI's Dr. George Veni served as a Ph.D. dissertation advisor for Miljana Golubović Deligianni in Greece. This complex area included dozens of basins excavated in the deep clay-rich soils of enormous sinkholes to store water (as above, center) piped in from other areas. Often, smaller but still large sinkholes occurred nearby (above, right).

2010-2011 BUDGET

	National Park Service		State of New Mexico		COMBINED	
	FY 10-11 Budget	FY 10-11 Actuals	FY 10-11 Budget	FY 10-11 Actuals	FY 10-11 Combined Budget	FY 10-11 Combined Actuals
REVENUE						
State General Funds Appropriation	0	0	444,887	451,764	444,887	451,764
Federal Fund Appropriation	323,000	323,000	0	0	323,000	323,000
Fund Balance (Carryforward)	0	0	630,146	630,146	630,146	630,146
TOTAL REVENUE	323,000	323,000	1,075,033	1,081,910	1,398,033	1,404,910
EXPENSES						
Staff	188,049	158,606	222,138	186,531	410,187	345,137
Students	0	0	15,000	31,212	15,000	31,212
Project Salaries Sub-total	188,049	158,606	237,138	217,743	425,187	376,349
FRINGE BENEFITS						
Staff	60,176	57,229	70,121	56,317	130,297	113,546
Students	0	0	300	113	300	113
Fringe Benefits Sub-total	60,176	57,229	70,421	56,430	130,597	113,659
TOTAL PERSONNEL EXPENSE	248,225	215,835	307,559	274,173	555,784	490,008
OPERATING EXPENSES						
Rent, Utilities, Telephone	0	9,355	33,800	36,994	33,800	46,349
Supplies & Expenses	14,325	27,549	30,470	118,576	44,795	146,125
Facility Fixtures	0	0	0	16,375	0	16,375
Travel	16,000	16,397	23,010	28,365	39,010	44,762
Contractor Services	500	6,046	0	950	500	6,996
Property & Equipment	1,500	1,119	26,754	78,082	28,254	79,201
NMT Administrative Support	0	0	20,000	20,000	20,000	20,000
NMT "Indirect" from NPS Budget (8%)	22,450	22,104	0	0	22,450	22,104
NPS "Indirect" to GRD at 6% on NPS appropriation	20,000	20,000	0	0	20,000	20,000
TOTAL OPERATING EXPENSE	74,775	102,570	134,034	299,342	208,809	401,912
TOTAL ALL EXPENSES	323,000	318,405	441,593	573,515	764,593	891,920

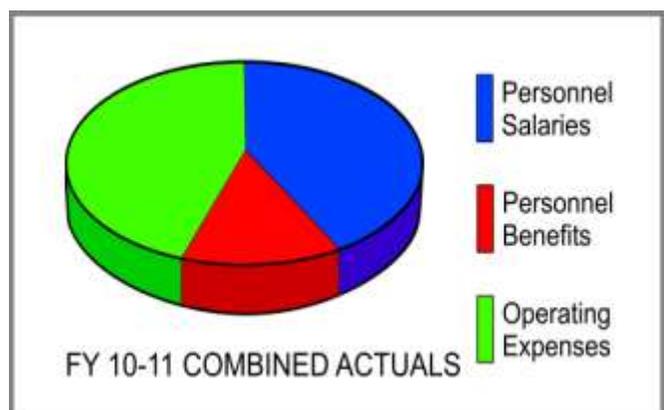
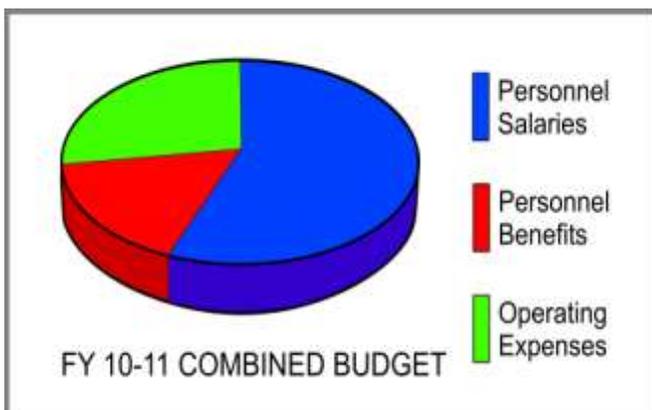


PHOTO ALBUM: NCKRI'S NEW HEADQUARTERS

Photos by George Veni

(Right) Debbie Herr at new reception desk made of tough, attractive, and eco-friendly bamboo.

(Middle right) Dr. Lewis Land in his new office.

(Bottom right) Ann Dowdy in NCKRI's bookstore; this desk is also made of bamboo.

(Bottom left) Access into NCKRI's artificial bat roost through hatches in an office floor. Six crevices for roosting bats are visible where the plate with the handle has been moved from one of eight compartments designed for mobile cameras. Seventy-two holes for temperature, microphones, and other probes extend throughout the roost. Six are visible and plugged behind the handled plate. Bats had not moved into the roost, probably due to a drought keeping many away from Carlsbad in Spring 2011.

