

CAVE SCIENCE NEWS

NEW SECOND DEEPEST CAVE IN THE WORLD

The Cavers Digest on the Internet carried a recent report that a Polish Expedition connected Vogelshacht and Lamprechtsofen, two caves in the Leoganger Steinberger area of Austria. The connection moves the system, now 1535 m deep, into the slot as second deepest explored cave in the world.

THEME SESSION ON EVAPORITE KARST IN OCTOBER

“Evaporite Karst: Origins, Processes, Landforms, Examples, and Impacts” will be the theme of a special oral session at the upcoming national meeting of the Geological Society of America. The meeting is to be held in Denver, Colorado, on October 27-31, 1996. The session is co-sponsored by the Hydrogeology and Engineering Geology Divisions of GSA. Kenneth S. Johnson of the Oklahoma Geological Survey and James T. Neal of Sandia National Laboratories will chair the session. Abstracts were due on July 9th. The day and time of this session will be Wednesday, October 30, 1996 at 1:30 PM.

ANDERSON WINS AWARD FOR KARST HYDROLOGY PAPER

Eric Anderson, NSS # 41495, of Hermitage, Tennessee has won special recognition at the regional science fair at Vanderbilt University by the Association of Women Geoscientists and by the American Meteorological Society. His paper, “Comparison of Physical & Chemical Discharge To Determine the Relationship Of Two Springs at Woodlawn Memorial Park, Nashville, Tennessee”, was also presented as a poster session at the 1996 NSS Convention in Salida, Colorado. Anderson is a 10th grade student at Martin Luther King Magnet High School for Science. Nashville Grotto member and hydrologist, Geary Schindel, was his adult sponsor during the four month research project.

EXPLORATION EDITOR REPLACEMENT NEEDED

The *Journal of Cave and Karst Studies* is looking for a new Associate Editor of Exploration. The former Exploration Editor of the *NSS Bulletin*, Louise Hose, has resigned to become the Editor of the *Journal*. The responsibilities of the Associate Editors are to solicit articles, arrange for appropriate reviews for papers within their fields of expertise, work with authors to prepare their manuscripts for publication, make recommendations concerning acceptance and rejection of submitted papers, and assist the Editor in gathering material for the

non-refereed sections of the *Journal*.

The *Journal* seeks to strengthen its exploration department and is looking for a pro-active caver with contacts in the exploration community. Interested candidates are asked to send a letter of interest and a curriculum vitae or resume by October 15, 1996 to:

Louise D. Hose
Environmental Studies Program
Westminster College
Fulton, MO 65251-1299

HOSE AND PISAROWICZ APPROVED BY NSS BOARD

The National Speleological Society Board of Governors approved the appointments of Louise D. Hose, PhD, as the new Editor of the *Journal of Cave and Karst Studies* and James A. Pisarowicz, PhD, as the Production Editor. Their appointments started with volume 58.

Both Hose and Pisarowicz have moved since they served as the Interim Editors of the first issue of volume 58. Their new addresses appear on the masthead of this issue. The Littleton, Colorado address given for the *Journal* in the first issue will continue to serve the *Journal* but will not be as timely as the new address in Fulton, Missouri.

INTERNATIONAL SPELEO EVENTS CALENDAR ON-LINE

The International Union of Speleology (UIS) has placed a Calendar of International Speleo Events on its world-wide web page according to Peter Matthews in a recent Cavers Digest. Their intention is to keep the calendar more current than the printed version in the *UIS Bulletin*. The address is:

<http://rubens.its.unimelb.edu.au/~pgm/uis/events.html>

Anybody or organization organizing a major caving, speleological or related event, or expedition may send details to the calendar web editor, Roger Taylor, by using the on-line form on the calendar web pages, or by mailing them to:

Mr. Roger Taylor
32 Medina Rd
Glen Waverley, Vic 3150
AUSTRALIA

**AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE ANNUAL MEETING
AND SCIENCE EXPOSITION, BALTIMORE, MD**

FEBRUARY 13, 1996

**TRACK: 'EXAMINING GLOBAL CHANGE'
SYMPOSIUM: "INTERACTIONS OF KARST
GEOLOGY AND ECOLOGY"**

Symposia Abstracts

**A CHEMOAUTOTROPHIC SUBTERRANEAN
ECOSYSTEM: BIOLOGICAL AND GEOLOGICAL
IMPLICATIONS**

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45221-0006

Thomas C. Kane, University of Cincinnati, Cincinnati OH
45221-0006

An unusual groundwater ecosystem was recently discovered in a thermal sulfidic cave in southeastern Romania. The numerous species of invertebrates discovered in the cave, most of them previously undescribed, live in an atmosphere that is very poor in oxygen and very rich in carbon dioxide. This groundwater ecosystem is isolated from the surface and does not receive allochthonous organic inputs of photosynthetic origin. Characteristic of this ecosystem is that it contains bacteria that produce organic matter using energy derived from the oxidation of hydrogen sulfide present in the thermo-mineral waters that flood the lower level of the cave. Microbial mats consisting of fungi and chemoautotrophic bacteria occur on the walls of the cave and are also found floating on the surface of the sulfidic water in the cave. This is the first known subterranean ecosystem that is completely chemoautotrophically based. In this regard it shares much in common with the deep sea vent communities discovered in the 1970s. Paleogeographical and molecular biological evidence support the hypothesis that some of the species living in this ecosystem have been isolated from the surface for several million years. Recent geomicrobiological studies indicate that sulfur oxidizing microbes inhabiting the cave affect limestone dissolution through the production of sulfuric acid.

**THE SOUTH CHINA KARST DEFORESTATION
ECOLOGICAL DISASTER**

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The south China karst belt has been profoundly and detrimentally impacted by massive post-1958 deforestation. The subtropical monsoon climate of south China endures an annual flood-drought cycle. This cycle has been sufficiently exacerbated by the loss of the "green reservoir" that desertification has occurred over large areas. A primary impact of deforestation has been lost retention of water in the uplands. Surface runoff has become more flashy and stream discharge reces-

sions brief. The consequence has been increased flood hazards during the rainy season followed by parched conditions during the dry season. Wildlife populations were decimated. Risks of crop failures have risen. Two trends thwart recovery: (1) heavy dependence of the local population on wood for fuel and (2) a population explosion. Reforestation efforts are underway but they are gradually losing to human encroachments. Development of ground water offers a degree of mitigation. However, the thin, shallow karst aquifers present have unusually great lateral hydraulic conductivities allowing for the rapid transmission of large volumes of water out of the region. They also are characterized by having minimal reservoir storage. Remarkable ground water developments, driven by desperation, are proceeding, but they are fraught with desperation owing to the poor aquifer characteristics.

**WATER CHEMISTRY ANALYSIS
OF ANCHIALINE CAVES**

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Anchialine caves are water-filled caves which occur in coastal karst. The submerged caves have surface openings inland and subsurface connections with sea water. The porous limestone allows the sea water to saturate the rock. This marine influence typically exists as a hypoxic layer of sea water beneath a less dense layer of brackish to fresh water. A distinct density interface delineates not only the salinity but oxygen and temperature differences as well as changes in pH and oxidation-reduction potential (ORP). For example, Cueva de los Carboneros, Cuba, oxygen readings of 0.14 mg/L and ORP of -263 mV were found at a depth 17 m and at 60 m the oxygen was 2.09 mg/L and ORP was 65 mV. Some caves are characterized by the presence of multiple layers, density interfaces. The biogeochemical mechanisms responsible for distinctly defined layers within the water column may be microbial activity, chemical dissolution of the limestone or a combination of the two. Water chemistry was evaluated using a portable sonde (YSI 6000). The data were correlated with fauna collections which consist primarily of crustaceans. Comparisons of water chemistry from several anchialine caves in the Bahamas, Cuba, and Mexico are discussed.

**THE ROLE OF KARST LANDSCAPE EVOLUTION
IN THE ORIGIN AND SPECIATION OF
HYPOGEAN FAUNA**

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The hydrologic and geomorphic development of karst terrains is closely tied to the origin and distribution of their hypogean

or subsurface fauna. The timing of the initial exposure of karstic rock and its development of caves and related voids also marks the time when epigeal species can begin to migrate underground. Once species have evolved into troglobites, weathering of the landscape begins to isolate populations and promote speciation. Erosional removal of surrounding cavernous rock is most effective at isolating species. Fault juxtaposition of karstic against nonkarstic rocks can have similar effects. Terrestrial (nonaquatic) species can be isolated by major stream valleys which may be floored with karstic rock but intersect the water table. As with initial karst development, the dating of these geologic processes can also provide timing constraints on speciation episodes. The distribution of aquatic hypogean species can be useful in delineating aquifer drainage basins. Species common to multiple drainage basins may suggest a hydrologic connection which may not be apparent from the hydrologic data. Hydrologic and ecologic management of karst areas can be enhanced by such geo-ecologic analyses, and additional relationships are being investigated which promise to yield valuable information for both disciplines.

IMPORTANCE OF VERTEBRATE REMAINS FROM CAVES

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Vertebrate remains from caves and karst features provide vital information on past biodiversity, paleoecology, and the development of the modern terrestrial ecosystem. Although most vertebrate-bearing deposits in karst features are of Quaternary age (<2 Ma old), karst associated vertebrate localities from at least as early as the Early Carboniferous are known. Additional important karst related vertebrate sites occur in the Permian, Triassic, and throughout the Tertiary.

Caves and other karst features are important sources of paleoecological data for several reasons. They frequently function as sediment traps over long periods of time (100s to 1000s of years). They also house a variety of vertebrates that provide a constant source of bones from a wide variety of animals. Often bones preserve well in the protected environment provided by karst features and are abundant enough to allow statistical analyses. In addition, the deposits frequently can be dated accurately and precisely.

Vertebrate remains from karst features provide data on paleoecology. They illustrate past biodiversity. The presence of certain taxa provides information on such parameters as climate, vegetation, soil conditions, and community structure of the past. Caves are one of the most important sources of vertebrate remains in the Quaternary. In the FAUNMAP database of US. Quaternary mammal occurrences, approximately 12% of the 2,937 localities are caves. However, occurrences from cave

sites represent about 20% of the total occurrences in the database. Almost 80% of the taxa represented in database occur in cave faunas and 15% occur only in faunas from caves.

EFFECTS OF ENTRANCES ON DISTRIBUTION AND ABUNDANCE OF CAVE ORGANISMS

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We operate under several familiar paradigms, one being that the cave environment is constant, except around entrances. However, the environmental factors of primary concern to biologists, temperature and humidity, are influenced by a variety of factors including the Mean Annual Surface Temperature, passage features including contour and slope, the volume of the cave, seasonal surface changes, and entrances. Entrances form essentially at random in caves, primarily related to inputs of water, collapse of passages to the surface, and the random intersection with vertical passages. (It has been estimated that 50-95% of limestone caves have no entrance.) The number, size and position of entrances relative to cave passages has tremendous influence on temperature and humidity. Cave entrances also pose significant management issues, regardless of the status of the entrances as natural, modified natural, or artificial. Entrances are often places of great beauty with fragile speleothems. Entrances are the access point to human use of cave resources, sites of archaeological or historic significance, and the exchange point for air and water. Nutrients enter caves through entrances in the form of litter and organic matter input by troglomorphic animals. Keystone species, which dominate on the basis of size or numbers, such as cave crickets, are particularly important in maintaining the food base of cave communities. Other animals use entrances as refugia.

The Mammoth Cave System in Kentucky is the longest cave in the world with over 330 miles of mapped passage. It's significance is recognized with a World Biosphere designation. With 23 current entrances (plus five closed historic entrances), Mammoth Cave presents a significant management challenge.

I am reporting on some results from our on-going National Park Service funded entrance biomonitoring project. The Park Service is in the process of restoring several entrances, modified and artificial, to their original air-flow status to reduce winter impacts of cold, dry air. In the intervening decades since most of the entrances were modified or opened, significant biological communities have expanded, developed, or been lost. In the first year of study, we are focusing on developing a standardized method for biomonitoring and collecting baseline data for selected entrances and control caves. We are studying

a wide range of cave types, including those that are part of the vast Mammoth Cave system, as well as isolated caves. The more types of habitats we study, the better are our chances of understanding what is really going on with the biology and ecology. The intention is to install air-lock entrances during the second year of the study, with our biomonitoring continuing for a third year to access the impact of the changes. The NPS is collecting data on temperature and humidity at locations inside and outside the caves.

We are concentrating on census of total populations by 10 m transects with particular emphasis on the keystone cricket species, *Hadenoeus subterraneus*, building on more than two decades of observation. Our long-term data have documented the impact of surface weather conditions on limiting foraging by cave crickets, which reduces input of guano, causing decreased abundance and diversity in the guano community. Studies have shown that there are differences in the number and composition of cricket populations in different caves. We are considering whether we are dealing with a metapopulation, where a loose assemblage of local populations is weakly linked by immigration and emigration, or a source/sink situation controlled by habitat heterogeneity. Either model allows cricket populations to spread the risk of local extinction, but also support our efforts to maintain existing habitats. Our studies have allowed us to compare distributions of crickets by age/size classes. We find smaller crickets located closer to entrances for access to foraging. We have observed shifts in distribution on seasonal and even a daily basis. We now recognize that an important measure of habitat suitability is ceiling height and texture, which provides small-scale refugia from temperature and humidity extremes. We are conducting seasonal mark-recapture studies of cave crickets, which again show us seasonal differences and fine-scale differences among and within our study and control caves. Studies of foraging behavior have developed from these observations. On-going modifications to gating plans include the addition of exit and entry points for cave rats and crickets. All of our studies are to be continued as we enter the third year of the study.

RECENT ISSUES OF CAVE AND KARST SCIENCE

The British Cave Research Association publishes a refereed scientific journal called *Cave and Karst Science: The Transactions of the British Cave Research Association* which has a similar mission to the NSS's *Journal of Cave and Karst Studies*. They, also, have made recent changes in the publication, including its name.

The second issue of volume 22, dated October 1995, included the journal's first color photographs on both the cover and accompanying a fine article on the explorations of the 1994 Yangtze Gorge Expedition to Sichuan Province, China which filled the issue.

The final issue of volume 22 (number 3) included the following articles:

The Relationship Between Surface Soils and Cave Sediments in West-central USA

Morphology of Rimstone Pools at Pamukkale, Western Turkey

Some Thoughts on Hydrothermal Caves

The Crystallogenesis of Gypsum Flowers

The Pinnacle Karst of Gunung Api, Mulu, Sarawak

Abstracts of papers presented at the BCRA Cave Science Symposium, February 1996

NSS members may arrange to subscribe to *Cave and Karst Science* through the NSS bookstore.