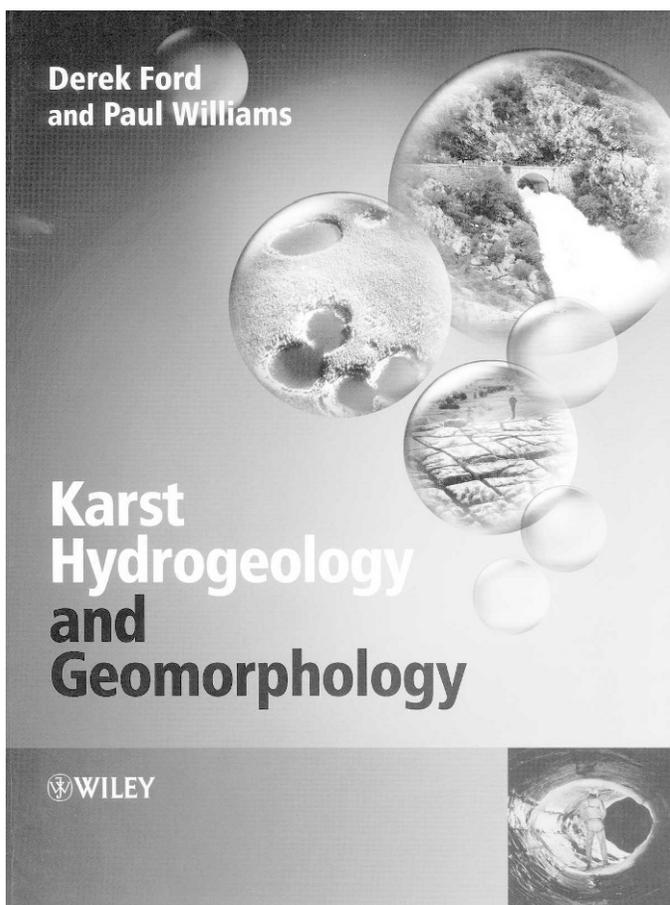


BOOK REVIEW



Karst Hydrogeology and Geomorphology

Derek Ford and Paul Williams, 2007. Chichester, U.K., John Wiley and Sons, Ltd., 562 p., 7.5 × 9.7 inches. ISBN 978-0-470-84996-5, hardbound, \$165; 978-0-470-84997-2, softbound, \$65.

This book is essentially the second edition of the authors' 1989 book, *Karst geomorphology and hydrology*. The change in title reflects a slight change of emphasis in the book and also highlights the increasingly important role of karst principles in addressing water-supply issues. The authors complement each other perfectly. They share similar backgrounds in classical British geomorphology. Ford specializes in cave processes, with emphasis on high-latitude and alpine karst. Williams is concerned mainly with karst surfaces and drainage patterns, with special attention to tropical karst. However, each has such a broad command of the subject that they are able to cover the entire field in an all-inclusive way.

The first edition had set such a high standard that writing a second edition posed a considerable challenge. It is impossible to keep up with the torrent of karst literature, even in one's own language, let alone on a global scale. A

glance at the massive references section will show how well the authors have met this challenge. In addition, the revised book had tight space limits. To achieve the seemingly impossible, the page format has been slightly enlarged and the font size reduced, so that the original 601 pages, plus new material, have been compressed into 562 pages. Coverage of some topics has been reduced from the first edition, but with little loss of substance. The new book compresses two lifetimes of karst knowledge into a very compact package. It is not for casual reading, but it is clearly written and well organized.

Chapter topics are identical to those in the first edition, except that a 12th chapter has been added on human impacts and environmental rehabilitation. Chapter coverage is as follows: (1) Introduction to karst: definitions, scope, global distribution, evolution of ideas. (2) Karst rocks: rock types, origin of rocks, and structure. (3) Dissolution processes: a rigorous approach that resembles a chapter from a geochemistry book. (4) Karst denudation. (5) Karst hydrogeology: nature of karst ground water and flow dynamics. (6) Karst drainage systems: hydrographs, well tests, computer modeling of aquifers. (7) Speleogenesis: a very systematic approach, with expanded coverage of computer modeling. (8) Cave interior deposits: sediments, minerals; at least half the chapter deals with age dating and paleoclimatology. (9) Karst landform development. (10) Climatic influences on karst. The final chapter of the first edition has been split into two, with expanded coverage of both topics: (11) Karst water resources management and (12) Human impacts and environmental rehabilitation.

The new edition retains the look and feel of the first, and it is only by delving into specific topics that the substantial changes become clear. A great majority of the material is based on the authors' personal experience, as it should be, and their personal enthusiasm shows through. Because of space limitations, certain topics such as paleokarst receive less coverage than one might wish. But the many references give access to extensive literature on all topics discussed in the book. The flow of ideas is smoother, the graphics are enhanced, and there is more emphasis on practical application. A few errors have been corrected, but inevitably a few others have crept in. Anyone bothered by this has clearly never tried to proof-read a lengthy technical book.

A comparison with other recent karst books is appropriate. W.B. White's *Karst Geomorphology and Hydrology* (Oxford Press, 1988) covers only the basic topics but in a more analytical way, with emphasis on functional relationships; its examples are mainly from the USA. W. Dreybrodt's *Processes in Karst Systems* (Springer, 1988) concentrates on the physical chemistry and hydraulics of karst aquifers and provides a basis for the

extensive digital karst modeling that he and his colleagues have done since. The volume *Speleogenesis – Evolution of Karst Aquifers*, edited by A. Klimchouk and others (NSS, 2000) concentrates mainly on the development of solution conduits and caves; it is well organized, but, like most multi-author works, its coverage is uneven in style and detail. Two recent encyclopedias on caves, edited by J. Gunn (2004) and D. Culver and W. White (2005) for Fitzroy-Dearborn and Academic Press respectively, contain an enormous amount of material extending well beyond the physical aspects of the subject, but (as in any encyclopedia) presented in disconnected pieces. The several volumes on karst hydrology and related topics written over the past few decades by P. Milanović (Lewis Press) are tightly focused on practical aspects of water supply and engineering in karst, with little theoretical or conceptual basis.

Anyone with a serious interest in karst will find the new volume by Ford and Williams to be useful. Should those who own the first edition also buy the second? For anyone so deeply involved as to ask this question, the answer is yes. The greatest benefit of all may be for those in fields other than karst, who need a knowledge of the subject for application to their own professions. Ground-water hydrologists come to mind, and that is a substantial reason for the change in emphasis in the book's title and contents. The soft-cover edition is robust enough to handle extensive use. Except for libraries and book collectors, an additional \$100 seems a steep price for a hard cover.

This new edition strengthens the book's position as the essential reference in the field. Karst geoscientists will not dare to stray beyond arm's reach of this volume. It is certain to remain the professional standard for many decades.

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Adits, Caves, Karizi-Qanats, and Tunnels in
Afghanistan: An Annotated Bibliography
by R. Lee Hadden



Topographic Engineering Center
US Army Corps of Engineers
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November 2005

Adits, Caves, Karizi-Qanats, and Tunnels in Afghanistan: An Annotated Bibliography

R. Lee Hadden, 2005. Topographic Engineering Center, U.S. Army Corps of Engineers, 80 p. Free PDF download at <http://stinet.dtic.mil/cgi-bin/GetTRDoc?AD=ADA444101&Location=U2&doc=GetTRDoc.pdf>.

Shortly after 9/11 the United States invaded Afghanistan with the intention of dislodging the Taliban government and Al-Qaeda. In particular, the leader of the Taliban, Mullah Mohammed Omar, and the leader of Al-Qaeda, Osama bin Laden, were desired targets. However, after the invasion, these two individuals and other high-value targets reportedly escaped into the Tora Bora caves and/or tunnels in the White Mountains near the Khyber Pass.

U.S. and coalition forces found themselves unfamiliar with the Tora Bora Mountains and sent out a request for cave and karst experts to provide any information available on the caves of Afghanistan and methods for detecting caves. Although I have no knowledge of what information was forwarded on to the U.S. Army, I suspect that the information received was less than hoped for. In addition, as explained in the Introduction, the bibliography was also begun as a result of requests from numerous individuals and groups (geologists, hydrologists, cavers, etc.) for

information on the caves, adits, tunnels, etc., of Afghanistan.

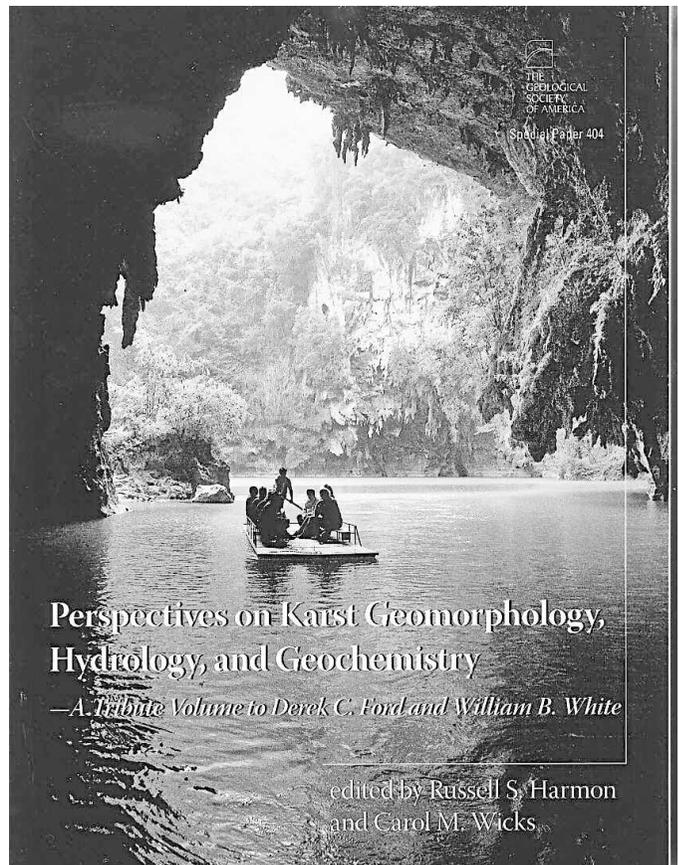
As a result of this demand for information, Lee Hadden, of the U.S. Geological Survey, transferred to the Army Corps of Engineers, where he undertook the development of a comprehensive bibliography of caves, tunnels, and other geological information in Afghanistan. As described in the abstract, this document combines selected citations from diverse sources that include cartographic, geological, and speleological materials, many of which were obtained from specialized library collections. The publications, reports, and maps in Arabic, English, French, German, Italian, Russian, and other languages were inventoried from several government and/or private libraries and geological information centers.

Citations were taken from sources openly published, which negated any need for military classification. It stands on its own. All URLs listed in the report (and there are many) were active as of November 2005. (Note the current web site date for this document is March 6, 2006, so it may have been updated some since its original publication.) As of the writing of this review, the web site for this bibliography was still available. However, should the site become inactive, this report will still be available from the National Speleological Society web site.

This is not light reading to settle in with before turning out the light at bedtime. As expected from a bibliography, it literally reads like the references section at the end of a journal article. However, it does contain a wealth of information and is detailed and carefully organized. Some color figures are published in the bibliography, and many URLs are listed in blue so they are readily visible even at a casual glance.

Because of the bibliographic nature of this document, it is difficult to recommend it to those with only a passing interest in Afghanistan. However, given the reasonable cost (a free download), large number of citations, quality, attention to detail, and the ongoing military operations in Afghanistan, it is worth checking out. Lee Hadden has produced a significant and important document that may be of considerable value to many individuals now and in the future. For these reasons, I recommend it to all interested individuals.

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Perspectives on Karst Geomorphology, Hydrology, and Geochemistry—A tribute volume to Derek C. Ford and William B. White

Russell S. Harmon and Carol M. Wicks (eds.), 2006. Geological Society of America, Special Paper 404, 366 p. ISBN 978-0-8137-2404-1, softbound, 8.5 × 11 inches, \$95 for nonmembers or \$67 for members. Order online www.geosociety.org or from Geological Society of America, 3300 Penrose Place, P.O. Box 9140, Boulder CO 80301-9140.

This volume contains papers on a broad range of karst topics, many of them by professional colleagues and former students of Derek Ford and William White. Both Derek and Will have recently retired from highly successful teaching careers at McMaster University and Pennsylvania State University, respectively, and both continue to pursue active karst research. This book is a tribute to their careers and also to their joint receipt in 2004 of the Distinguished Career Award from the Quaternary Geology and Geomorphology Division of the Geological Society of America.

The book reflects the kinds of topics that Derek and Will championed, and which are now integral to karst research. The authors include a large proportion of North America's leading karst specialists, and a few from overseas. Typical for a commemorative book, many of

the chapters are updates of previously published work, but they are expanded with new insight. To my knowledge, none are simple retreads of earlier papers.

The book's 28 chapters are divided almost equally into three sections: geomorphology, hydrology, and a loose category of geochemistry-mineralogy-biology. These are preceded by several tributes to Derek and Will. Two chapters are provided by the honorees themselves: Ford reviews North American contributions to karst geomorphology, caves and deposits, and White summarizes the past half century of karst hydrology.

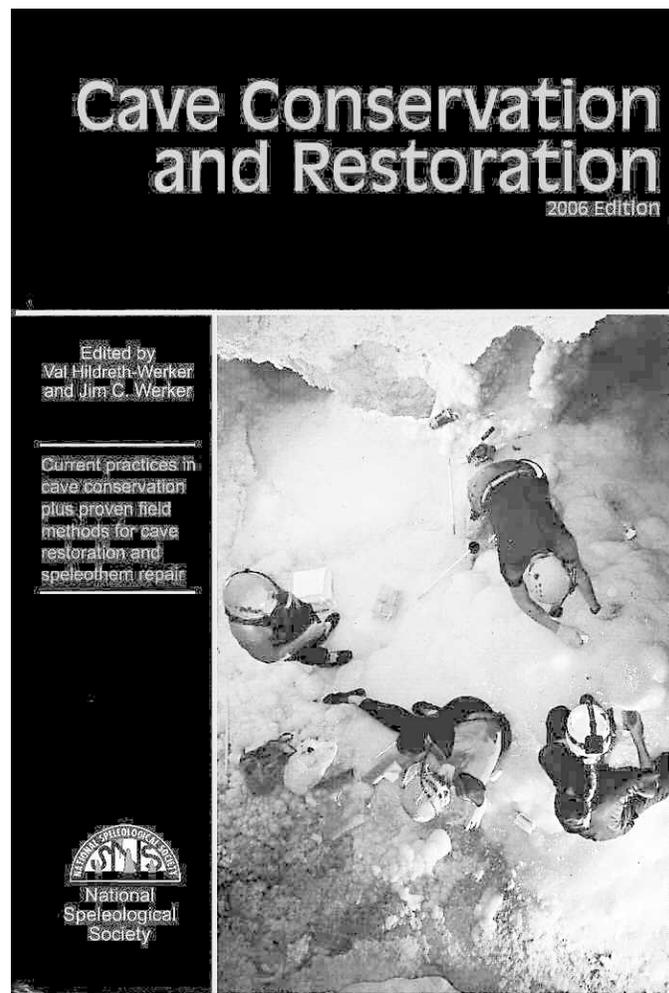
The geomorphology chapters describe field sites around the globe. Topics include dating of karst events in the Cumberland Plateau of Tennessee; use of detailed structural mapping in West Virginia to determine early conduit development; and confined, bathyphreatic cave development in Missouri. Studies in other countries cover the origin of springs by rising volcanic sulfides in Tamaulipas, Mexico; the extensive karst drainage systems of the Yucatan Peninsula; caves in brecciated, non-bedded carbonates in Belize; the strange karst of the Nullarbor Plain in Australia; varied karst processes in young limestones of the Mariana Islands, and Kenyan caves dug by elephants to obtain salts from the volcanic host rock.

The hydrology chapters have a strong emphasis on the Florida karst. Of these, some deal with water supply, such as problems of groundwater overdraft in Florida; dewatering of aquifers by evaporation and enhanced drainage caused by excavations; and ground-water contamination in southern Indiana. Many chapters concern borehole investigations: comparison of head variations in monitoring wells to those in nearby cave passages to determine the hydraulic properties of an aquifer; geochemical tracing of ground water; estimating porosity from stratigraphy, borehole imagery, geophysics, and GIS-based spatial analysis. Other topics include sediment variation during storms to interpret the pattern of subsurface conduits; the persistent view of non-karst hydrologists that karst aquifers behave like porous media; and problems and promises of digital modeling of karst aquifers.

Geochemical-mineralogical topics include the storage of contaminants in cave sediments; changes in CO₂ level vs. saturation index in a karst aquifer; speleothem types and growth rates vs. water chemistry; geochemical clues to calcitization of aragonite speleothems; and speleothem luminescence and its value for interpreting past environmental changes. Finally, two biological topics are considered: a comparison of microbially-driven sulfur systems on Earth with potentially similar ones on Mars; and biological influence on speleothem growth, especially around cave entrances.

This may seem like an eclectic group of topics, but they all provide valuable information about recent advances and field techniques. In the future, this book will provide a clear snapshot of the state of karst research at the beginning of the 21st century.

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Cave Conservation and Restoration

Val Hildreth-Werker and Jim C. Werker, 2006. Huntsville, Ala., National Speleological Society, Inc., 600 p. ISBN 1-879961-15-6, softbound, 7.0 × 10.25 inches, \$37 for NSS Members; \$39 regular retail price. Order on-line at www.NSSBookstore.org.

This book was edited by the co-chairs of the NSS Conservation Committee, who also happen to be the co-editors for the annual Conservation issue of the NSS News, which is published in March of every year. In fact, the March 2007 issue of the NSS News includes a brief introduction to the book with a series of quotes from the Foreword of the book written by Ronal C. Kerbo (Werker and Hildreth-Werker, 2007).

The emphasis of this book is primarily on cave restoration and repair, but also includes discussions on conservation. It is recognized that any form of intrusion by man has an impact on a cave. In this instance, intrusion is

not limited to physical entry, but may also include releases of waste streams and other similar types of impacts.

To be as broad as possible in coverage, this book utilized the expertise of 46 scientists, karst conservations, cave restorationists, and speleothem-repair experts. The intent of this book is for use as a field manual emphasizing best management practices in cave conservation and management. Information is presented in easy-to-find sections that are cross-referenced and indexed.

Most figures and photos appear as black-and-white, but a selected set of photos are shown in full color in the center of the book and are also cross-referenced. Units of measure are written in both metric and English throughout, but because construction materials sold in the United States are measured in English units, construction materials necessarily deviate from the metric/English format.

As with any undertaking of this magnitude, it is likely that some individuals will find some omissions, although I seriously doubt that very many will be noted. I did detect some typographical errors and some formatting discrepancies, but none of any real consequences.

Cave Conservation and Restoration consists of four parts, each of which is broken down into sections that are further subdivided into papers detailing a particular conservation or restoration issue related to caves; 84 separate papers in all, plus eight Appendices and Biographical Notes! Many of the papers are no more than a few pages long, which makes for quick reading in some instances. More complicated protection or restoration issues necessarily required longer papers.

Part One includes the Introduction which is broken down into a Foreword and Preface, both of which are well-worth reading. This part really explains how the book came about and its importance.

Part Two emphasizes Cave Conservation, Management, and Ethics. It is further divided into sections that include several papers each. The sections are: Section A Identifying and Protecting Cave Resources; Section B Developing Cave Management Programs; and Section C Improving Caver Ethics. Although perhaps less exciting than the physical restoration and/or repair of caves and cave features, it remains a vital aspect of cave protection and deserves the prominent position near the beginning of the book.

Part Three focuses on Cave Restoration, which might be more exciting to some individuals. It includes the following sections: Section A Introducing Cave Restoration; Section B Organizing Cave Projects; Section C Restoring Cave Passages; and Section D Restoring Speleothems. Reading this section will likely get many cavers thinking about their impact on caves and possible plans for restoration. This section probably should be read over prior to undertaking even a minor cave restoration project (if there is such a thing as minor).

Part Four moves on to actual Speleothem Repair with the following sections: Section A Introducing Speleothem Repair; Section B Repairing Speleothems; Section C

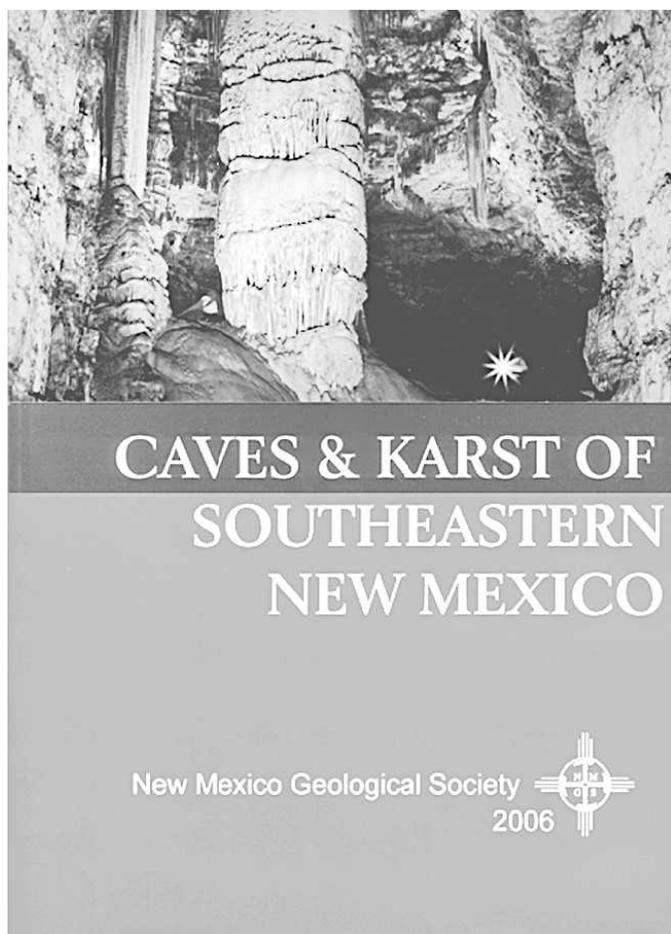
Specialized Mechanical Assists; and Section D Success Stories and Blunders. Referring back to the Foreword by Ronal Kerbo, one finds a disturbing discussion of a vandal's attempt to steal the Candle Table ("a beautiful stalagmite with rimstone encircling its top") from a cave high in the Guadalupe Mountains of southeastern New Mexico (Kerbo, 2006, pp. 3–5). It was later repaired by Ron Kerbo, Joe Spencer, and Jerry Trout (who is currently the National Cave Coordinator for the USDA Forest Service). Techniques developed over many years of experience by numerous individuals involved with such vandalism as the destruction of Candle Table went into the writing of Part Four, even though the number of authors for this part are limited to just a few.

Given the very reasonable price for this book and its importance to all cave and karst enthusiasts, I strongly recommend its purchase. From exploring to actual physical restoration or repair, it doesn't matter because of the nature of the information contained therein. Scientists planning on conducting studies in caves that might adversely impact the cave of interest should consider reviewing relevant sections of this book prior to initiating the study.

References

- Kerbo, R.C., 2006, Foreword, *in* Hildreth-Werker, V., and Werker, J.C., eds., *Cave conservation and restoration*: Huntsville, Ala., National Speleological Society, Inc., p. 1–7.
- Werker, J.C., and Hildreth-Werker, V., 2007, *New NSS book on conservation and restoration*: NSS News, v. 65, no. 3, p. 4–5.

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Caves and Karst of Southeastern New Mexico

Lewis Land, Virgil W. Lueth, William Raatz, Penny Boston, and David L. Love (eds.), 2006. Socorro, NM, New Mexico Geological Society, 2006, 344 p. ISBN 1-58546-092-3, softbound, 8.5 × 11 inches, \$50.

This is the guidebook for New Mexico Geological Society's 57th annual field conference, held in September, 2006, at Washington Ranch, near Carlsbad. The first 109 pages are heavily annotated road logs for geology field trips. Then 16 color plates are followed by 22 technical papers. While the road logs and their discussions necessarily cover mostly surface features, one of the articles is a detailed geologic guide to the self-guided tour of Carlsbad Cavern. Another article discusses Fort Stanton Cave, and in particular, the recently discovered Snowy River Passage, with an emphasis on the paleohydrology of the cave. A number of articles discuss sulfuric-acid speleogenesis in the area or compare it to examples elsewhere. Victor Polyak et al. give a longer exposition of the $^{40}\text{Ar}/^{39}\text{Ar}$ dating of Guadalupe Mountains caves first published in *Science* in 1998. Several articles discuss evaporite karst at the (radioactive) Waste Isolation Pilot Plant east of Carlsbad. A few of the articles are not really on topic, but I found one of them, about the history of

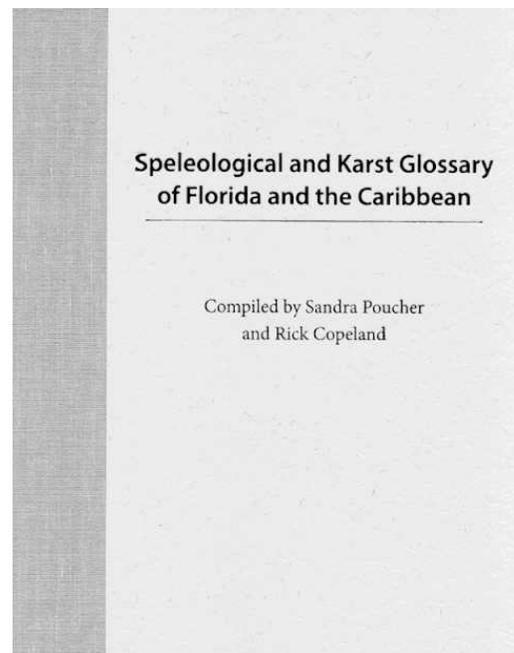
geologic investigations in the area through 1928 and the long controversy about the date of the rocks there, particularly interesting.

The book is generally well produced, although some illustrations are reduced too much and the binding-edge margins are way too narrow. *Caves and Karst of Southeastern New Mexico*, which is dedicated to Carol Hill, gives a more readable, if less comprehensive, overview of the cave geology in the area than Hill's 1987 monograph.

References

- Hill, C.A., 1987, Geology of Carlsbad Cavern and other caves in the Guadalupe Mountains, New Mexico and Texas: New Mexico Bureau of Mines and Mineral Resources, Bulletin 117, 150 p.
 Polyak, V.J., W.C. McIntosh, N. Güven, and P. Provencio, 1998, Age and origin of Carlsbad Cavern and related caves from $^{40}\text{Ar}/^{39}\text{Ar}$ of alunite: *Science*, v. 279, p. 1919–1922.

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Speleological and Karst Glossary of Florida and the Caribbean

Sandra Poucher and Rick Copeland (eds.), 2006. Gainesville, Florida, University Press of Florida, 196 p. ISBN 0-8130-3006-4, hardcover, 6 1/4" × 9 1/4 inches, \$34.95.

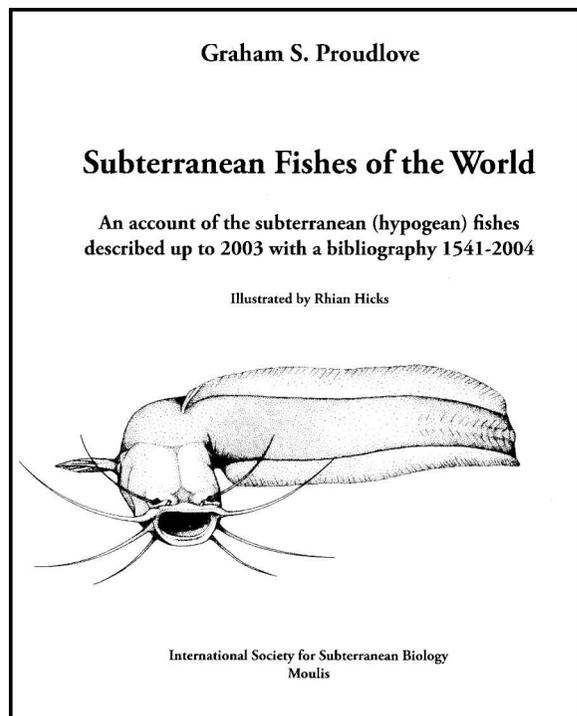
This volume brings together representative terminology from several distinct fields of study, notably caving and cave diving, speleology, geology, biology, hydrology, legislative and regulatory matters, toxicology and environmental monitoring, surveying, and resource management—

as well as various miscellaneous subjects that do not conveniently fit any category. At first glance, these may seem to be very disparate disciplines; however, they share a common ground in that they all relate to the scientific study, conservation, and long-term management of caves and underground water resources. Wise stewardship of these valuable and irreplaceable resources requires the coordinated efforts of a variety of professionals who must have at least a general knowledge of the roles played by each other. This glossary should serve as a useful reference for those who need definitions of terms that may only be tangentially related to their own particular fields, but are still allied to the general topic of karst hydrogeology.

Definitions in the book have been taken from a variety of sources—some more authoritative than others. References are included after each entry. When a term is commonly used in more than one context, multiple definitions are provided. Another useful feature is that frequent reference is made to other entries that may be synonyms, antonyms, or otherwise closely related to a particular term. Because of the technical nature of many entries, some definitions rely on the use of yet other technical terms, many of which are themselves defined elsewhere in the text. However, some definitions are based on specialized terms that remain undefined anywhere in the text. This can make it rather difficult to tease out the meaning of some words.

All definitions are terse and to the point. Coverage is not encyclopedic, and no significant attempts seem to have been made to clarify—or to simplify in lay terms—difficult concepts for the reader who is not already well informed about the field. Thus, the ease of fully understanding many of the technical definitions will vary with one's familiarity with the subject, or one's motivation to delve into other resources. This is not necessarily a shortcoming. The book is, after all, meant to be a glossary and not a comprehensive encyclopedia of terms. This compilation will serve admirably as a springboard to direct one's attention to certain topics that can be pursued in more depth elsewhere. In gathering together in one place such a diverse set of terms, this work represents a long-overdue first step in breaking down interdisciplinary barriers caused by specialized jargon and scientific terminology—definitions of which sometimes require considerable legwork to track down.

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Subterranean Fishes of the World: An account of the subterranean (hypogean) fishes described up to 2003 with a bibliography 1541-2004

Graham S. Proudlove, July, 2006. International Society for Subterranean Biology, Format: 304 pages, 87 black and white figures, 20 colour plates. Illustrations by Rhian Hicks. ISBN 10 2-9527084-0-1. ISBN 13 978-2-9527084-0-1, 8.25 × 11.5 inches, \$65, 50 €. Distributors: www.speleobooks.com (USA), www.caves.org (USA), www.nhbs.co.uk (UK), www.stevensimpsonbooks.com (UK) and www.speleoprojects.com (Switzerland).

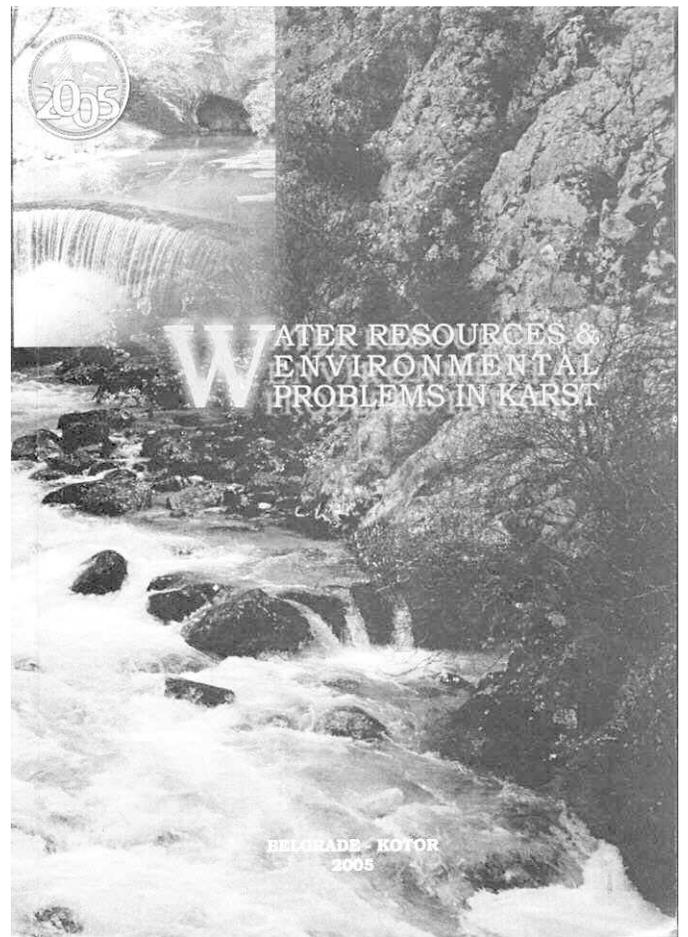
There are almost 30,000 described species of fish. In comparison, the diversity of hypogean species—with somewhat more than 100 species—may seem limited, but these fish have proven to be of extraordinary interest in biological research. Hypogean fishes serve as model systems in various disciplines such as developmental biology, ethology, ecology, and evolution. The underground provides unique habitats in which fishes from various phylogenetic lineages have evolved. These products of evolutionary change are some of the most bizarre and fascinating creatures. The specialized morphology of cave fishes, with their reduced eyes and pigmentation, is but one consequence of life in darkness. Owing to the scarcity of energy, for example, many cave fishes have a reduced metabolic rate, which allows some species, like the northern cavefish *Amblyopsis spelaea*, to survive up to two years without food.

The interest in hypogean fishes is reflected in the vast number of publications currently available. One of the Proudlove's major objectives is to provide a complete overview of the published literature on this subject, and the

bibliography is the key element of the book. With meticulous effort over more than 20 years, he has collected roughly 1600 references on the subject. He considered not only scientific journals but also “gray literature,” which is often difficult to find. *Subterranean Fishes of the World* is certainly the most concise account of hypogean fishes to date.

The book is divided into the following sections: (1) A short introduction on the biology of hypogean fishes is provided, which highlights their geographic and systematic distribution. This section also includes an overview of non-stygobitic fishes in caves and a history of cave-fish investigations from 1842 through 2003. (2) A section dedicated to species described up to 2003, as well as some known but undescribed forms, with taxonomic and systematic information (Family, Types, Systematics, Museum holdings). A figure illustrating most of the species gives the reader an excellent impression of the morphological diversity of cave fishes. Some species are also shown in color photos at the end of the book. Information on distribution and habitats complete the individual accounts. Finally, a list of references (or key references for species that have been more extensively investigated) links the species accounts to the comprehensive bibliography. In places, Proudlove goes beyond reciting published literature and provides his own inferences and conclusions. For example, he suggests that various cave forms that are currently considered nonspecific with related surface forms (e.g. *Poecilia mexicana* or *Garra barreimiae*) should be treated as distinct taxa based on the phylogenetic species concept. Proudlove concludes that the valid name for the Mexican cave tetras is not *Astyanax mexicanus* but *A. jordani*. This notion will certainly be debated in the scientific community and warrants more research. (3) Six appendices include explanations of abbreviations, institutions, and specific terms, as well as lists of blind and depigmented fishes from non-subterranean habitats, species that once were considered to be subterranean but are not known to be so, and non-troglobitic fish reported from caves worldwide (a contribution by Bill Poly). A compilation of relevant addresses leads readers to further sources.

While reading the accounts of individual species, one notices an enormous skew in the amount of research that has been conducted on the different species. For example, some species have only one reference (usually the first description), whereas others may have dozens. A drawback of the book is the lack of detailed data on the ecology of certain species. However, Proudlove cannot be blamed, because this information is only available for very few species. For the most part, we currently have no idea of how these fish behave, what they eat, or how they reproduce. Basic knowledge about the ecology and population biology of cave fishes would be important in developing efficient management and conservation plans. Many species of hypogean fishes, as Proudlove points out,



Water Resources and Environmental Problems in Karst

Zoran Stevanović and Petar Milanović, 2005. Institute of Hydrogeology, Faculty of Mining and Geology, University of Belgrade, Djušina 7, Serbia & Montenegro, 903 p. ISBN 86-7352-144-0, hardbound, 7.25 × 9.625 inches, 45 €. Order via e-mail from Zoran Stevanović (zstev@eunet.yu).

This book is a special publication of the Institute of Hydrogeology of the University of Belgrade and is the Proceedings of the International Conference and Field Seminars organized by the National Committee of the International Association of Hydrogeologists (IAH) of Serbia and Montenegro held in Belgrade and Kotor in September 2005. It is dedicated to the famous Serbian karst scientist, Jovan Cvijić, to mark the 110th anniversary of his publication, "Karst" (see review of the book, "Cvijić and Karst," in this issue).

The five main topic areas, all environmentally focused, were emphasized at this conference. They are listed as:

1. Vulnerability of karst environments and ecological problems,
2. Management and sustainable use of karstic water resources,
3. Hydrogeology and multidisciplinary research of karst,
4. Impact of man-made structures on karst ecosystems, and
5. Vulnerability of geo- and bio-diversities in karst and their protection, legal aspects and environmental education.

A total of 132 papers by 304 authors representing 32 countries from six continents are roughly equally distributed among the five main topic areas.

The first topic area covers various vulnerabilities of karst environments, with papers ranging from vulnerability mapping (e.g., EPIK, PI methods) and pollution assessment (e.g., DNAPL remediation), with an emphasis on ground-water protection, to more obscure topics such as seismic impact of explosive blasts in quarries on spring discharges. None of the papers really address ecological problems to any significant degree, which I found disappointing. Mostly, the papers address ground-water contamination problems that naturally affect the biota. In the future, I would like to see more detailed ecological papers, which is sorely in need of more comprehensive studies.

The second topic area on management of karstic aquifers will be very interesting to those individuals involved in the exploitation of water resources. Ground-water supply from karstic aquifers is often a difficult undertaking and this section covers many important aspects, from aquifer descriptions, to issues associated with coastal zone aquifers, to physical exploitation and regulation. Of particular significance to me was Richard Parizek's paper on enhanced management of karstic aquifers, which is practical and relevant to problems in many areas in the U.S.

The third topic area, hydrogeology, covers many aspects of common investigative techniques for ground-water flow and transport in karstic terrains. These techniques range from ground-water tracing and spring flow hydrograph analysis, to methods for addressing submarine springs. This is the largest section in the book with many very interesting papers that mostly address advances in the common techniques used for years.

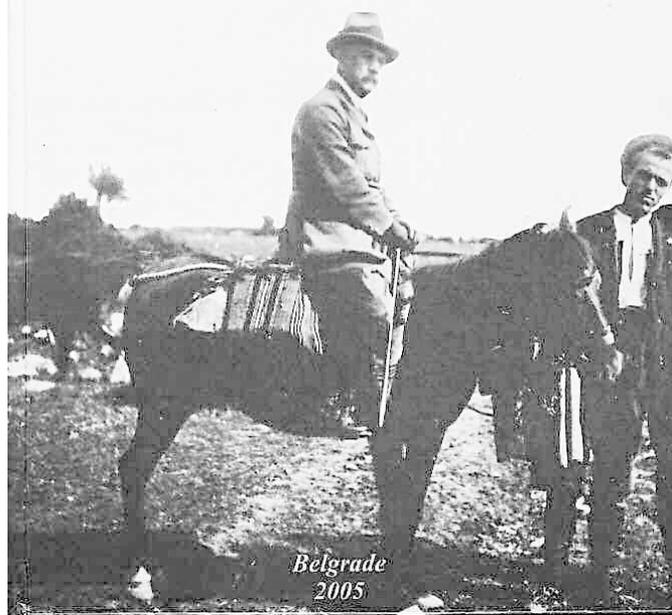
The last two topic areas, impacts of man-made structures and vulnerability of geo- and bio-diversities, address more engineering and legal aspects, respectively. Impacts of man-made structures is the shortest section, but still significant. Most of the impacts papers cover the problems associated with tunnels and grout curtains. The vulnerabilities section is longer and mostly focuses on various aspects of protecting and managing karst aquifer systems. This section by far covers more ecological-based papers with its focus on biodiversity than any of the other topic areas. However, its inclusion of geodiversity adds to its value because the unique ecology of karstic systems is dependent on the geology, so one cannot be emphasized without the other.

The amount of information contained in this book makes it well worth the relatively modest price of 45 € (\$61.21 at the time of this writing). It represents an up-to-date listing of some of the more pressing karst environmental problems and possible solutions we currently face.

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Serbian Academy of Science and Arts
Board on Karst and Speleology

CVJIĆ and KARST
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Cvijić and Karst
Cvijić et Karst

Zoran Stevanović and Borivoje Mijatović, 2005. ZUHRA Belgrade, Serbian Academy of Science and Art (SASA) and its Board on Karst Speleology, 405 p. ISBN 86-7025-381-X, hardbound, 7.25 × 9.50 inches, 25 €. Order via e-mail from Zoran Stevanović (zstev@eunet.yu).

This book represents a special commemorative edition published by the Serbian Academy of Arts and Sciences to mark the 110th anniversary of publishing of the monograph *Karst* by Jovan Cvijić. It contains extracts of two of Cvijić's most important studies (one in English and the other in French), as well as articles written by well-known international scientists about Cvijić's work, life, and evaluations of his contribution to hydrogeology, geomorphology, tectonics and human sciences.

This book was arranged to (1) present a short biography of Cvijić's life, (2) translate and present Cvijić's essential theories and conclusions from his seminal works, and (3) present the opinions of some present day karst experts in geology and hydrogeology. Biographies developed by P. Vujevic in 1957 and more recently by M. Vasovic in 1997, along with a diary written by Cvijić's wife, form the first part of this book.

Part 2 of this book consists of selected extracts of Cvijić's famous monograph, *Karst, A Geographic Monograph* (published by the Royal Publishing House Belgrade in 1895), that were translated into English and published in this book. This monograph is essentially a translation of Cvijić's doctoral thesis *Das Karstphänomen, Versuch einer morphologischen Monographie*. The excerpts chosen for translation focus mostly on the influence of water, the genesis of karstic features, and the karstification process, with a particular emphasis on the formation of dolines (sinkholes). In terms of the formation of dolines, Cvijić's discussion in the monograph, with supporting examples based on practical experience, made the case for erosive processes working on fissure networks at the karst surface. His arguments were so persuasive as to render the theory of cave roof collapse almost an afterthought. This monograph also addresses karren, karstic rivers, sinking streams, karst springs, waterfall genesis, and various karst valleys (blind, semi-closed, and dry). In particular, his chapter on poljes is significant in that he provided a definition, classification and explanation of hydrologic functions, and geological structures and genesis of poljes as the largest karst-landscape feature.

Selected extracts from Cvijić's monograph *La Géographie Des Terrains Calcaires* (published in French) were also included in this book, but without translation into English. It is a compilation of Cvijić's work begun just before he died. The most important chapter, Factors in Karstification, emphasizes "karst underground hydrography" was based on two earlier articles, *Circulation des eaux et érosion karstique* and *Hydrographie souterraines et évolution morphologique du karst*. This was the one disappointing aspect of the book to me because I don't read French and would have liked an English translation.

Finally, the opinions, evaluations, and statements of some renowned karst experts round-out this book. Introductory essays by D. Ford and H. Zojer initiate this part. It is followed by extracts of previously published articles by J. Zötl, P. Lamoreaux, M. Bleahu (in French), and J. Nicod (in French) on the history of hydrogeology and karstology. This is followed by articles emphasizing Cvijić's role in hydrogeology, summaries of Cvijić's contributions to the state of modern karst science, analyses of Cvijić's contributions to geology and tectonics, and an assessment of Cvijić's effort at anthropogeography. Unfortunately, many of these reviews appear in French.

Although much of this book was published in French, it is well worth the price of 25 € (\$33.86 at the time of this writing). It contains a wealth of historical karst information, as well as being very interesting to read regarding the development of modern karst studies.

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