

A new edition of “Caves: Processes, Development and Management”

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Abstract

My textbook “Caves: Processes, Development and Management” was first published in 1996 and won the UIS Outstanding Publication Award in 1997. It has been reprinted three times and was made available as an e-book in 2009. The book has been widely used in cave and karst training courses in the USA, Europe and Australia. A new edition has been commissioned by the publisher Wiley International and is due late 2019. It will be completely revised and printed in full colour with 200 colour plates. There is an expanded treatment of cave hydrology and speleogenesis. The text has been expanded from ten to fifteen chapters and has a greater emphasis on the human uses of caves, cave and karst management. There will be a linked website with figures as powerpoints for download.

Introduction

This book was first published in 1996 and has been reprinted 3 times in both hardback and paperback covers. An e-book version was made available in 2009 and continues to sell well. “Caves: Processes, Development and Management” was awarded the prize for the *Most Significant Publication on a Cave or Karst Topic* at the International Union of Speleology conference, La Chaux de Fonds, Switzerland in August 1997.

A new edition, due in August 2019, will be published by Wiley International for global distribution. The text is completely revised and will be published in full colour with over 200 photographs. The book will be global in scope but with some emphasis on Australasian, North American and Southeast Asian examples.

The target audience of readers includes:

- senior undergraduate students
- postgraduate researchers
- tourist cave guides
- cave and karst managers in government agencies
- natural and cultural heritage professionals; and
- anyone interested in caves!

Some reviews of the first edition of “Caves”

“Provides the most comprehensive description of karst management yet encountered in an English language text ... a welcome addition to the bookshelves of cavers and karst scientists alike” *Cave and Karst Science*

“More than 20 years have elapsed since publication of the previous English-language book to treat the science of caves, so the time was ripe for a good review ... Gillieson provides it here.” *Derek Ford, Ground Water*

“Reading through this book I found that I suddenly understood things which I had previously found a bit of a mystery. One of the really attractive things about this book is its price. It is available at... a fraction of the cost of most textbooks.” *The International Caver*

“Gillieson’s *Caves: Processes, Development and Management* is one of the very few comprehensive textbooks on cave science in the English language. With chapters on cave ecology and cave management alongside those on cave formation and sediments, it takes a contextual and holistic approach to caves (as parts of wider karst landscapes, and as ecosystems); in doing so it introduces various facets of cave science beyond the usual geological/geomorphological one.” *Martine Pierquin, University of Edinburgh*.

“The 1996 edition was pitched at the undergrad-postgrad level, but succinct enough that researchers and professionals needed it to hand for frequent consultation, and yet written well enough to be accessible to the large number of amateur cavers who go into the game for its adventure but become interested/fascinated in the many interesting phenomena they observe/crawl through.” *Anonymous reviewer for Wiley Publishers*.

New Table of Contents

The following chapters have been approved by the publishers and are being written. This is a considerable expansion of the ten chapters in the original version and the new book will run to about

440 pages. There is an expanded treatment of cave hydrology and speleogenesis. The book also has a greater emphasis on the human uses of caves, cave and karst management.

Part One: Processes

One: Introduction

Two: The Cave System and Karst

Three: Cave Hydrology

Four: Processes of Rock Dissolution

Part Two: Development

Five: Speleogenesis

Six: Cave Interior Deposits

Seven: Cave Sediments

Eight: Dating Cave Deposits

Nine: Cave Deposits and Past Climates

Part Three: Management

Ten: Cave Ecology

Eleven: Cave Archaeology

Twelve: Historic Uses of Caves

Thirteen: Cave Management

Fourteen: Catchment Management

Fifteen: Documentation of Caves

Each chapter will have at least one “boxed” example e.g. in Chapter 3 there is an account of the hydrology of the Mammoth Cave plateau, Kentucky. In Chapter 7 there is an extended account of the evidence for the use of fire by *Homo erectus pekingensis* at Zhoukoudian Cave near Beijing.

There will also be a linked website, maintained by Wiley, with the figures available as Powerpoint or pdf files for free download. An example of the format of this resource for the text *Speleothem Science* can be seen at:

<http://bcs.wiley.com/he-bcs/Books?action=index&bcsId=7193&itemId=1405196203>

Chapter 3 Box: Hydrology of the Mammoth Cave plateau, Kentucky

The Mammoth Cave System is located about 160km south of Louisville, Kentucky, and about 56km northeast of Bowling Green, Kentucky, USA. It is the longest cave in the world by a factor of three, with about 631km of surveyed passage. The cave system is formed in the Girkin, Ste. Genevieve and St. Louis limestone formations, which dip gently to the northwest and are wrinkled by a number of small anticlines. The limestone is in places overlain by insoluble sandstones and shales. To the south of Mammoth Cave National Park these rocks have been largely eroded away to form the Pennyroyal Plateau, and limestone occurs just under the soil over a very large area punctuated by many sinkholes. To the north these resistant rocks form the dissected ridges and small cuestas of the Chester Upland, with limestone in the deep valleys. Groundwater in the limestone is derived in part from drainage from these high areas, and there are numerous sinkholes along the edge of the sandstone uplands. The Green River lies in a deep trench and is fed by 53 springs from the limestone as it flows west to join the Ohio River.

Our detailed knowledge of the hydrology of the Mammoth Cave region is the result of intensive study over the last three decades by Jim Quinlan, Ralph Ewers, Joe Ray and other workers. This work has entailed more than five hundred dye-tracing experiments, 2700 water level measurements, and mapping of more than 800km of cave passages by the Cave Research Foundation, National Parks Service and other speleological organisations. It is probably the most intensively investigated karst in the world. A detailed map of flow routes and the potentiometric surface is but one of the many products of this research. Any serious student of karst hydrology should study this map (Figure 1) as an example of how to conduct a detailed investigation. This work has led to new passages being discovered linking the various elements of the whole cave system (Figure 2).

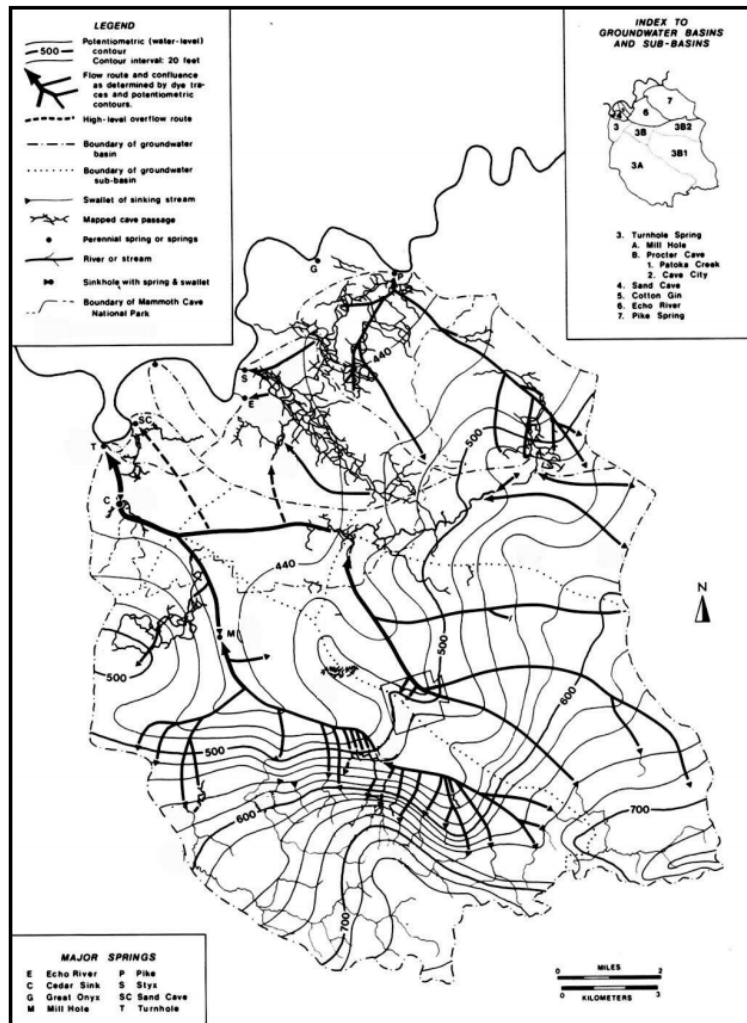


Figure 1: Hydrology, potentiometric surface and underground flow routes defined by dye tracing in the Turnhole Spring karst basin of Mammoth Cave, Kentucky.



Figure 2: Phreatic passage in Flint Ridge Cave showing mounds of fluvial sediment and roof pendants due to slow moving water.

Chapter 7 Box: Cave Sediments and Environmental History at Zhoukoudian, China

Southwest of Beijing lies the World Heritage site of Zhoukoudian, often called the Peking Man site. A number of limestone caves, some unroofed, lie

around Dragon Bone Hill. Here a deep sequence of sediments (Figure 3), up to 35m thick, contains skeletal material, bone and artifacts associated with the hominid *Homo erectus pekinensis*. These have been dated by a variety of techniques to between 770,000-300,000 years ago.



Figure 3: Main fossil site (Western section) viewed from the entrance of the Pigeon Hall Cave, Zhoukoudian, China

The main evidence for burning at the site is the presence of constructed fireplaces and hearths in association with burnt bones and stone tools in unit 4 (circa 400,000 years ago). The presence of wood ash in a cave at a site where trees would have been absent at the time confirms the deliberate use of fire for cooking. Burnt bones are also associated with stone tools in unit 10 (circa 800,000 years ago). Reddish

sediments in unit 10 (Figure 4) are associated with high values of magnetic susceptibility, again supporting the idea of *Homo erectus* using fire. This is much earlier than previously suspected and the ability of hominids to both hunt and cook food may have conferred a major advantage in both nutrition and time available for other pursuits.



Figure 4: Main Western section at Location 1, Zhoukoudian. Stratigraphic units 5 to 8-9 are clearly visible.