

Cambrian System of China and Korea

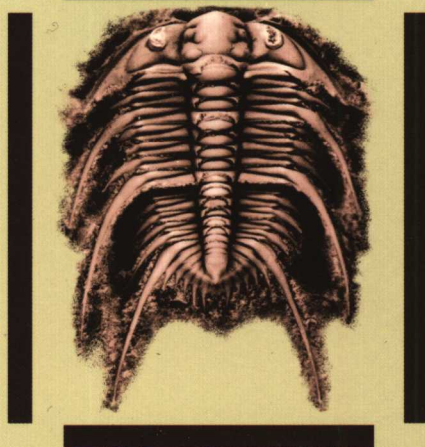
Guide to Field Excursions



*IV International Symposium on
the Cambrian System*

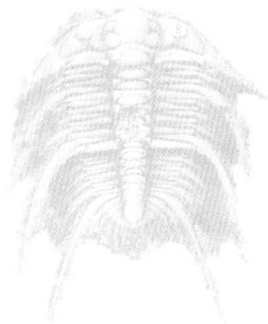
and

*X Field Conference of the
Cambrian Stage Subdivision Working Group*



/ Edited by

PENG Shanchi, Loren E. BABCOCK, and ZHU Maoyan



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内 容 简 介

本书是 2005 年在中国召开的第 4 届国际寒武系大会暨第 10 届寒武系再划分工作组会议的野外考察指南。介绍了中国的滇东、黔东和黔北、湘西北、三峡峡东、陕南和陕东、浙西、豫西以及韩国东北部太白山(Taebaeksan)地区 8 个寒武系经典、热点研究地区的寒武纪地层和生物群。每一野外考察指南着重介绍该地区寒武系的岩石、生物和年代地层划分以及系统古生物方面的最新研究进展。全书内容丰富,简介了 30 余条寒武系剖面,包括“澄江动物群”、“凯里动物群”、“瓮安动物群”、“牛踢塘动物群”原产地的寒武系剖面;全球寒武系首个“金钉子”湖南花垣排碧剖面;3 个竞争全球寒武系待命名阶“金钉子”的贵州八郎、湖南王村南和浙江碓边剖面;中国华南寒武系“晋宁阶”、“梅树村阶”、“王村阶”、“酉水阶”、“排碧阶”和“芙蓉统”的层型剖面;中国华北寒武系“毛庄阶”、“徐庄阶”、“张夏阶”和“崮山阶”的层型剖面以及韩国著名的“太白型”和“闻越型”寒武系剖面等。

本书可供国内外地层古生物学者、地质院校和相关院校师生以及区域地质调查工作者参考。

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Palaeodotes hunanensis (Yang)

from the Cambrian Huaqiao Formation,

Paibi, Huayuan, northwestern Hunan;

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FOREWORD

This volume includes contributions from the Fourth International Conference on the Cambrian System, held in Nanjing, China, in August 2005. The conference was combined with the Tenth Field Conference of the Cambrian Stage Subdivision Working Group. Eight field excursions to classical Cambrian localities in China and South Korea were organized as a part of the meeting, although only six trips were run. This book contains guides to the field areas visited as part of the conference. As originally planned, four pre-conference trips involved excursions to eastern and northern Guizhou, western Hubei, western Zhejiang, and western Shandong, China; and four post-conference trips involved excursions to eastern Yunnan, northwestern Hunan, and southern Shaanxi, China, as well as the Teabaekshan Basin, South Korea. Guides for the planned trips to western Zhejiang, China, and the Taebaeksan Basin are included here although the trips did not actually take place.

In the last fifteen years, great progress has been made in many aspects related to Cambrian geology globally. Discoveries of the Chengjiang, Kaili, and Weng'an faunas, establishment of the first intra-Cambrian Global Standard Stratotype-section and Point (GSSP) in China, and detailed work on the stratigraphy and paleontology of the Teabaekshan Basin, are examples of these new achievements. Effort was made for each field trip guide to show the current state of information on the field localities. Participants had an opportunity to see, for example, Cambrian strata that contain the Chengjiang Biota in Yunnan and the Kaili Biota in Guizhou, Cambrian phosphorites bearing phosphatized fossil embryos and small shelly fossils, the Weng'an Biota, in Guizhou and Shaanxi, and the GSSP for the base of the Furongian Series and Paibian Stage in Hunan. In the Shandong and Hubei excursions, international participants had the opportunity to see for the first time classical Cambrian localities previously known to them only from literature.

Terms for lithological units of China used in the field guides follow those applied by Lu *et al.* (1982) and Zhang *et al.* (2003). Instead of the Pinyin spelling (standard Chinese spelling) of stratigraphic names as used in some literature, stratigraphic terms are spelled out in their original forms. Separate sets of chronostratigraphic schemes have been developed for North China and South China, so stage terminologies used in these guidebook articles are applied differently. The guides for trips to Shandong and Shaanxi use the traditional stage terms established mainly from platform strata of Shandong, Liaoning, and Yunnan, whereas the other field trip guides use the newer terms based mainly on the slope stratigraphy of Hunan, Guizhou, and Yunnan. Except for the term "Meishucunian Stage," there is no conflict in the meaning of terms. Meishucunian, however, refers to a rather expansive interval of the lower Cambrian as it is applied in the traditional sense developed from the North China platform. A more recent, restricted usage, as defined by Luo *et al.* (1994), was developed for the South China chronostratigraphic scheme. For convenience in

interpreting the relationship between North China and South China stratigraphic terminology, a chart is provided here.

Newly Proposed Chronostratigraphy South China <small>(Peng, 2000, 2003; Peng & Babcock, 2001)</small>		Traditional Chronostratigraphy North China & Yunnan <small>(Xiang et al., 1981; Xiang, 2001)</small>	
FURONGIAN	HUNANIAN	UPPER CAMBRIAN	FENGSHANIAN
	PAIBIAN		CHANGSHANIAN
WULINGIAN	YOUSHUIAN		KUSHANIAN
	WANGCUNIAN	MIDDLE CAMBRIAN	CHANGHIAN
	TAIJIANGIAN		HSUCHUANGIAN
QIANDONGIAN	DUYUNIAN		MAOCHUANGIAN
	NANGAOAN	LOWER CAMBRIAN	LUNGWANGMIAOAN
			TSANGLANGPUAN
DIANDONGIAN	MEISHUCUNIAN		CHIUNGCHUSSUAN
	JINNINGIAN		MEISHUCUNIAN

I would like to express my sincere thanks to all authors for their efforts in producing the guides, and to the students who helped in preparing illustrations and conducting field work related to preparation of the guidebook articles. I also thank Mrs. Lin Caihua for skillfully editing this guidebook, making it ready for press despite a shortage of time. In organizing the conference and in preparing the field guides, we received financial support from the National Natural Science Foundation of China, the Chinese Academy of Sciences, the Nanjing Institute of Geology and Palaeontology, the Chinese Academy of Sciences, the State Key Laboratory of Palaeontology and Stratigraphy, and the International Subcomission on Cambrian Stratigraphy. To these institutions I express my deep appreciation.

Peng Shanchi
Chair of Organizing Committee of the 4th
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EXCURSION 1: EASTERN YUNNAN, SOUTH CHINA

This excursion starts at Kunming, the capital of Yunnan Province, China. Kunming is located at 25°14'N, 102°43'E, in the center of the Yunnan-Guizhou Plateau, and at an elevation of 1894 m. It is called the “Spring City” because the annual average temperature is 14.5°C. Kunming is famous for its unique geographic position, beautiful landscapes, and rich cultural heritage. A four day excursion will focus on the stratigraphy and paleontology of the Ediacaran-Cambrian boundary interval and the lower half of the Cambrian System in eastern Yunnan Province. Field stops during the first two days will be in the vicinity of Dianchi Lake, which is a prominent geographic feature in the Kunming area. Localities to be visited include some of the most important Chengjiang fossil localities in Chengjiang County and the Haikou area of Kunming. We will also visit the well-known Ediacaran-Cambrian boundary section at Meishucun of Jinning County. Field stops during the last two days will involve study of sites elsewhere in eastern Yunnan that expose the Ediacaran-Cambrian boundary and successions in the lower half of the Cambrian.

EDIACARAN-CAMBRIAN BOUNDARY SECTIONS AND EARLY CAMBRIAN CHENGJIANG NONMINERALIZED FOSSILS IN EASTERN YUNNAN PROVINCE, SOUTHWESTERN CHINA: INTRODUCTION

ZHU Maoyan and ZHANG Junming

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INTRODUCTION

Eastern Yunnan lies on the southwestern margin of the Yangtze Platform, South China. Lower Cambrian strata are extensively developed and well exposed in the area (Fig. 1). Since the beginning of the last century (Depret, 1912), eastern Yunnan has been a special place for the study on the Neoproterozoic-lower Cambrian in China (Zhu *et al.*, 2001), because of the following reasons: 1, the presence of well developed, well exposed Lower Cambrian strata containing the most complete sequence of lower Cambrian shallow-water environments in China; and 2, the presence of abundant fossils recording a clear succession of Early Cambrian communities. Particularly during the last 20 years, the distinctive small shelly fossils (SSFs) have been regarded as the some of the best taxa for defining the GSSP of the Precambrian-Cambrian boundary (Luo *et*

al., 1982, 1984; Qian and Bengtson, 1989). Another important aspect of the area is the extraordinarily well-preserved non-biomineralized fossils showing diverse and unusual body plans present in the Chengjiang Biota in the Yu'anshan Formation (e.g., Chen J. Y. *et al.*, 1996; Chen and Zhou, 1997; Hou *et al.*, 1999, 2004; Luo *et al.*, 1999; Chen L. Z. *et al.*, 2002; Chen J.Y., 2004). During

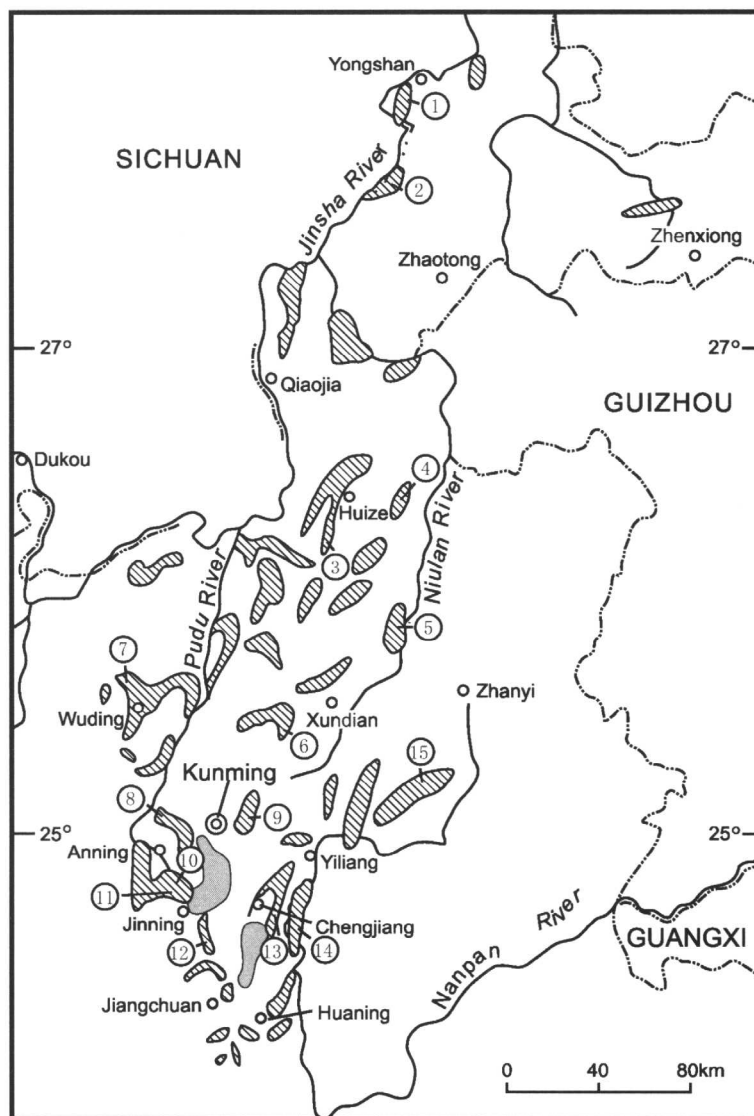


Figure 1. Geological map showing outcrops of the Ediacaran-Cambrian boundary interval in the eastern Yunnan Province. 1-15. The sections have been investigated by us. 1. Xiaotan section, Yongshan County; 2. Jinshachang section, Yongshan County; 3. Dahai section, Huize County; 4. Dabu and Yulu sections, Huize County; 5. Deze section, Qujing City; 6. Xiangfeng section, Xundian County; 7. Sapushan section, Wuding County; 8. Qiongzhusi section, Kunming; 9. Jinmacun section, Kunming; 10. Ercaicun section, Haikou, Kunming; 11. Meishucun section, Jinning County; 12. Wangjiawan section, Jinning County; 13. Maotianshan and Dapotou sections, Chengjiang County; 14. Baichele section, Yiliang County; 15. Kuanshan section, Malong County.

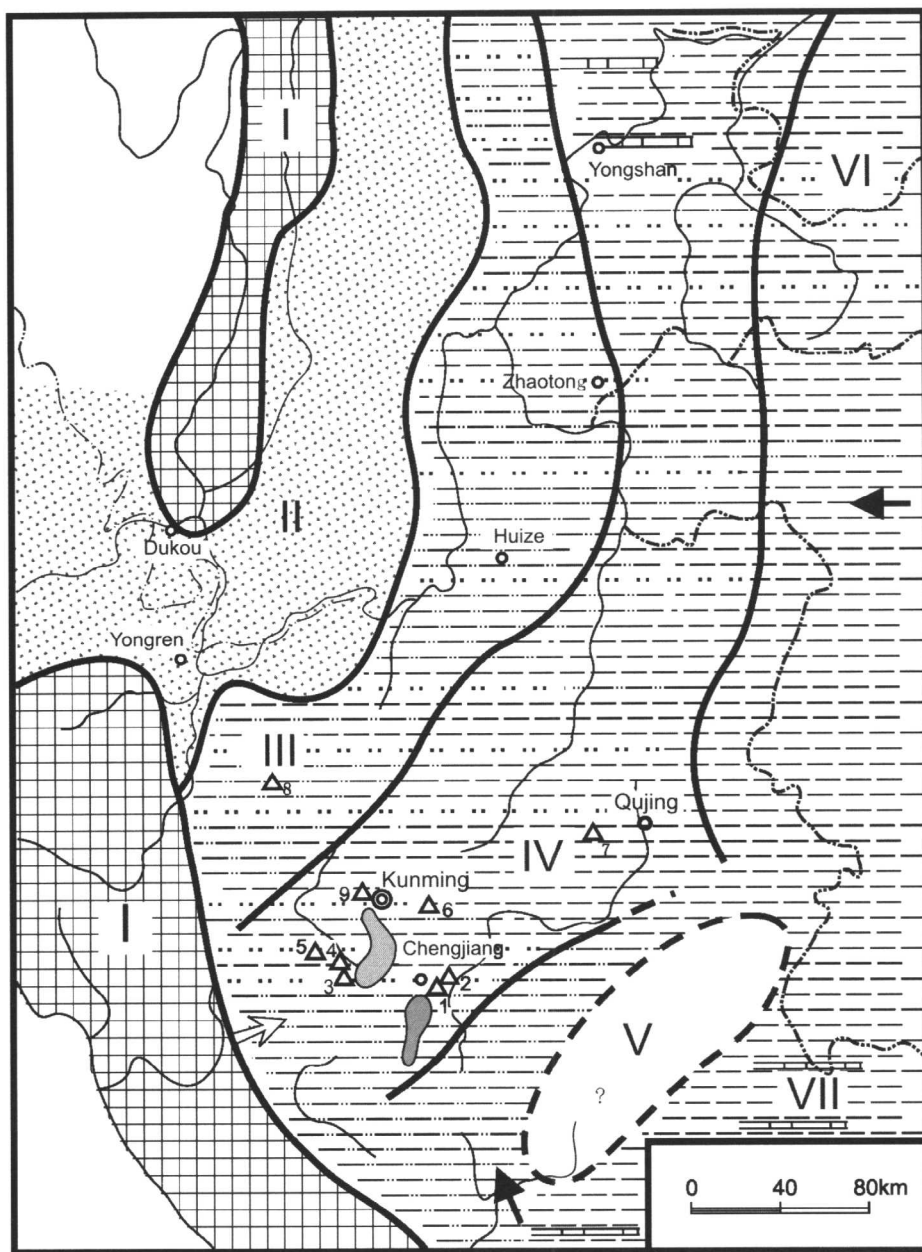


Figure 2. Palaeogeographic map of the eastern Yunnan area during the time of the Maotianshan Shale Member. I. Old land; II. Nearshore sandstone facies; III. Upper shoreface silty mudstone facies; IV. Lower shoreface to offshore mudstone with intercalations of siltstone facies; V. The Niushoushan underwater swell; VI. Offshore black shale facies; VII. Offshore shale and carbonate facies. 1-8. Important soft-bodied fossil localities. 1. Maotianshan in Chengjiang County; 2. Ma'anshan in Chengjiang County; 3. Meishucun in Jinning County; 4. Ercaicun in Kaikou, Kunming; 5. Shankoucun in Anning County; 6. Kebaoacun in Yiliang County; 7. Kuangshan in Malong County; 8. Sapushan in Wuding County; 9. Qiongzhusi, Kunming.

the past 20 years, fossil quarries have been opened mostly in the area around Kunming, but new quarries and localities now have been investigated throughout eastern Yunnan, and even in the Zunyi area of Guizhou Province (Steiner *et al.*, 2005), because the Maotianshan Shale from the middle part of the Yu'anshan Formation is widely distributed in the area (Fig. 2).

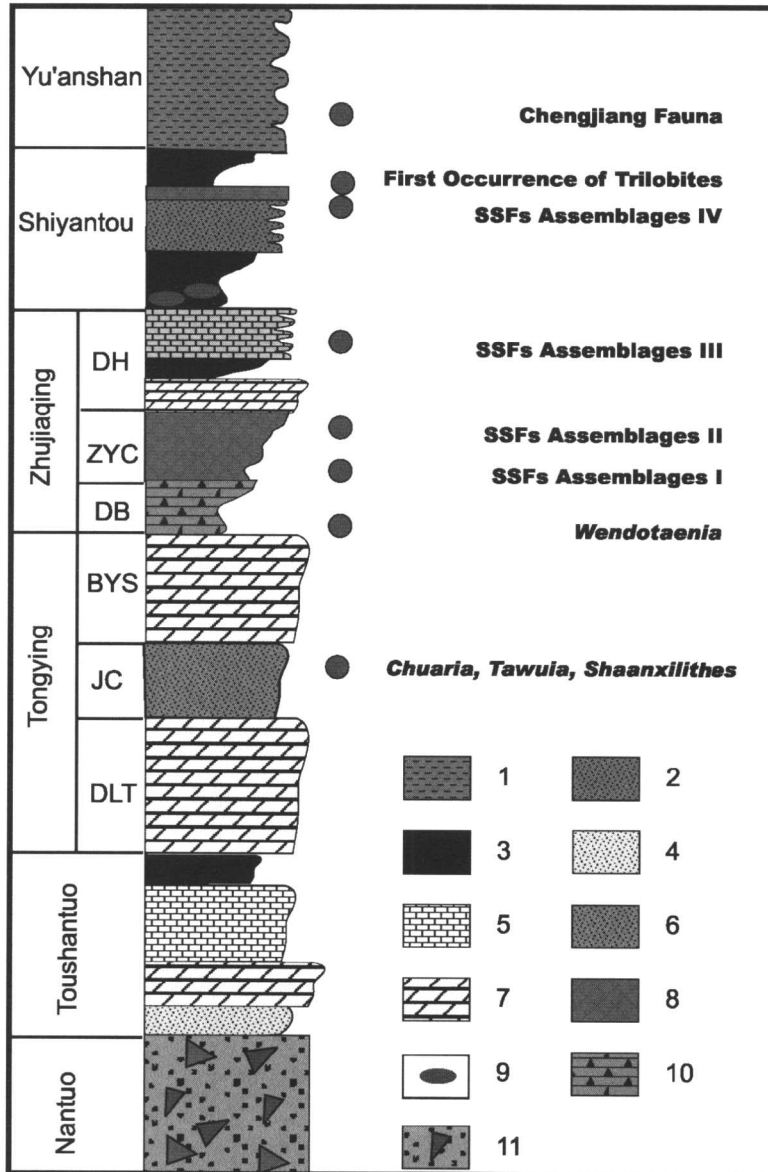


Figure 3. General stratigraphy of the Ediacaran-lower Cambrian in eastern Yunnan Province, China. DH=Daihai Member; ZYC=Zhongyicun Member; DB=Daibu Member; BYS=Baiyanshao Member; JC=Jiucheng Member; DLT=Donglongtan Member; 1. Shale and Silty Shale; 2. Dark-grey siltstone; 3. Black shale; 4. Light-color sandstone and siltstone; 5. Limestone; 6. Pink or brown siltstone; 7. Dolomites; 8. Phosphorite; 10. Carbonate concretion; 11. Diamictites.

STRATIGRAPHY

The Ediacaran and lower Cambrian in eastern Yunnan consist of five stratigraphic units. In ascending order, they are the Touthantuo, Tongying (Dengying), Zhujiaping, Shiyantou, and Yu'anshan formations (Fig. 3). General descriptions of these formations are given below.

Touthantuo Formation

The Touthantuo Formation in the eastern Yunnan area exhibits dramatic facies variations. In the local reference section near Wangjiawan in Jinning County it is about 120 m thick. It consists of: 1, brownish shale at the base; 2, sandstone and oolitic dolomite in the lower part; 3, limestone and shale in the middle; and 4, sandstone at the top. The lower part of formation shows characteristic features of alluvial and beach deposits. The sequence of the Touthantuo (Doushantuo) Formation in the Kunming area shows obvious difference from that in other area of the Yangtze Platform, for this reason the Touthantuo Formation in Kunming areas was previously named as the Wangjiawan or Nalusi Formation. In the Chengjiang area, there is a 20 m massive dolomite in the lower part, and a black shale and muddy dolomite at the top of the Touthantuo Formation (Fig. 4). A similar facies transition occurs at the contact between the Touthantuo Formation and the Tongying Formation in the Yangtze Gorges area.



Figure 4. Black shale interval at the top of the Touthantuo Formation, Dongdahe, Chengjiang County, Yunnan.