

植物王国的小矮人

The Miniature Angels in the Plant Kingdom

苔藓植物

----- An Introduction to Bryophytes -----

中英文版

Chinese-English Edition

张力 左勤 洪宝莹 / 著

Zhang Li Zuo Qin Hong Pou leng



拟短月鲜 *Bryum meniopsis gymnastoma*

徐丽莉 Xu Li

SPU 南方出版传媒

广东科技出版社

GUANGDONG SCIENCE & TECHNOLOGY PRESS

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毛尖金发藓 (雄株) *Polytrichum piliferum* (male)

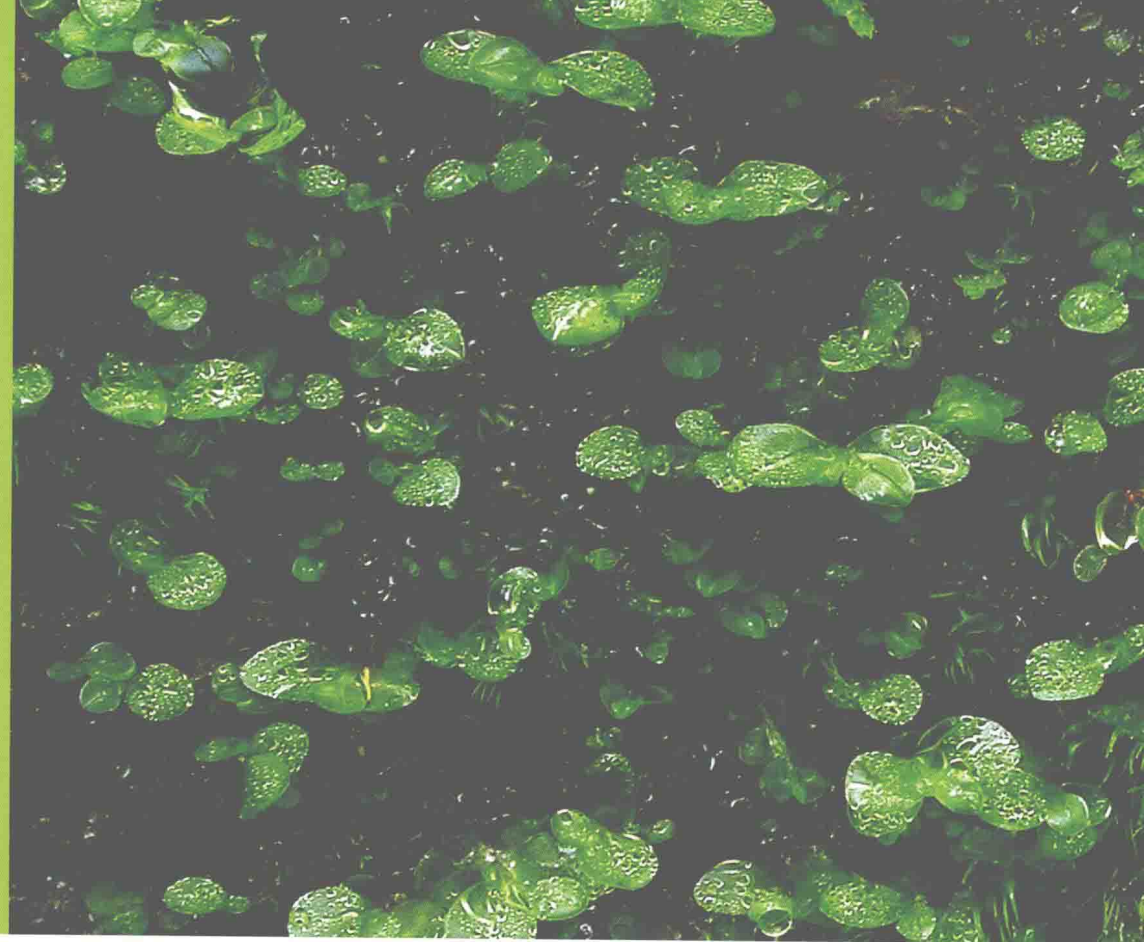




南亚小曲尾藓 *Dicranella coarctata*



序_I



虽然苔藓植物个体微小、少人关注，却是陆地生境的重要组成部分，从北半球寒温带的泥炭地到南极大陆的岩石海岸，随处可见。苔藓植物的形态变化多端，物种数仅次于显花植物，在生态系统中发挥着许多关键作用。它们能减少公路边山坡和河岸边土壤的流失、降低大气中碳和氮的含量、在热带雨林中捕获及循环矿质元素，以及为小型动物提供食物和栖息场所。尽管包含苔类植物、藓类植物和角苔类植物三大类群的苔藓植物对生态系统的稳定作出了如此巨大的贡献，但它们往往被公众、环保人士乃至野外生物学家忽视——源于人们对其知之甚少。

《植物王国的小矮人——苔藓植物》（中英文版）是一本优秀且可读性很强的苔藓植物科普读物，有助于增强读者了解、保护苔藓植物及其生境的兴趣。该书除了简要地介绍苔藓植物的生活史，并以三种典型的苔类、藓类和角苔类植物为例，比较了它们形态上的异同，也介绍了苔藓植物的重要性，如何采集和鉴定苔藓植物，以及保护策略。全书辅以大量苔藓植物在自然状态下的精美彩照及精准图注。对于一些较为微观的形态特



蕨叶曲灯藓 *Cyrtomnium cf. hymenophyllioides*



桧叶金发藓 (雄株) *Polytrichum juniperinum* (male)

征，诸如孢子、油体和芽胞等，书中亦展示了非常美妙的显微照片。

这本书除了关注中国的苔藓植物，对全球的学生和博物学者而言，亦是一本卓越的参考书。该书以中英双语对照编写，设计精美，内容充实。它以精彩和令人耳目一新的视角引入进入植物王国小矮人的微观世界，无论学生还是专业人士都能感受它的魅力。它也是一本富于“乐趣”的书，让您乐于拥有和分享。任何欣赏自然之美的人，都将会非常喜爱和享受这本书。

美国南伊利诺依大学卡本戴尔分校

植物学系荣誉教授

芭芭拉·克朗多-斯达勒





Foreword

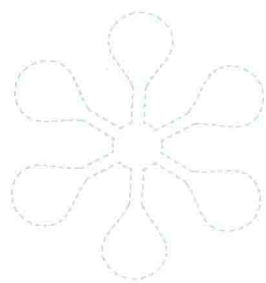
I

Although small in size and little appreciated by most people, bryophytes are a ubiquitous and fundamental component of all terrestrial habitats, from the peatlands of the northern boreal zone to the rocky shores of Antarctica. They come in diverse forms, being second only to flowering plants in total number of species, and have many key functions in the ecosystem. Among other things, they hold soil in place along highways and rivers, help reduce levels of atmospheric carbon and nitrogen, capture and recycle minerals in tropical rain forests, and provide both food and lodging to small animals. Despite these important contributions to ecosystem stability, mosses, liverworts and hornworts, the plant groups collectively referred to as bryophytes, are often overlooked, not only by the public, but also by conservationists and field biologists, who know little about them.

This Chinese-English edition of "The Miniature Angels in the Plant Kingdom: An Introduction to Bryophytes" is an excellent, very readable source of information about bryophytes that will broaden interest in the study and preservation of these plants and their habitats. In addition to a concise review of the bryophyte life cycle and the comparative morphological features of a typical moss, liverwort and hornwort, there are sections on the importance of bryophytes, how to collect and identify bryophytes, and strategies for conservation. The text is beautifully illustrated with a gallery of perfectly labeled color photographs of bryophytes in their natural settings distributed throughout. There are also very nice photomicrographs of select morphological features, like spores, oil bodies, and gemmae.

While focused on Chinese bryophytes, the book is an excellent reference for students and naturalists around the world. It is completely bilingual (Chinese and English), beautifully designed, and well written. It provides a wonderful, refreshing view into the world of small plants that will appeal to students and professionals alike. It is a "fun" book that is a pleasure to own and share with others. It will be much enjoyed by anyone who appreciates nature.

Barbara Crandall-Stotler
Professor Emerita, Department of Plant Biology
Southern Illinois University, Carbondale, USA





位于美国伊利诺依州南部的小大峡谷是苔藓植物的理想家园
Little Grand Canyon, Southern Illinois of U.S.A. is a paradise for bryophytes



序_{II}



粗叶白发藓 *Leucobryum boninense*



在包罗万象的植物界中，苔藓植物可以说是最不起眼，也最容易被人忽视的一群。它们被俗称为青苔，现代汉语词典上的解释是：植物界的一大类，植株矮小，有假根。就是这样一群不起眼的神奇小植物，在唐朝诗人刘禹锡笔下成了活灵活现的景致，他的名篇《陋室铭》中，有“苔痕上阶绿，草色入帘青”的千古佳句。

人们对苔藓植物的关注与研究，是否因为刘禹锡的名句而受到启发，当然不得而知，也无从考证。但在现代文明社会中，随着经济社会的发展、科学技术的进步，以及人们对生态环境的日益重视，任何一种植物都可成为专家学者关注与研究的对象，它们对自然界与人类的独特贡献，不论大小，同等重要。

深圳市中国科学院仙湖植物园的有关专家，多年来致力于苔藓植物的研究，并取得了一系列重要的研究成果，例如，与中国科学院华南植物园合作编撰的《广东苔藓志》，以及与澳门特别行政区民政总署联合出版的《澳门苔藓植物志》《澳门苔藓植物名录》和《植物王国的小矮人——苔藓植物》



深咖啡色球体为一种小叶苔成熟的孢蒴
Dark brownish spherical bodies are the mature sporophytes of *Fossombronia* sp.

等著作。其中2009年在澳门发行的《植物王国的小矮人——苔藓植物》以繁体中文英文对照写成，是专门为学校师生、自然爱好者和市民编写的科普读物，书中科学地揭示了苔藓植物是什么、包括哪些类别、与其他类群的植物如何区分、有哪些特殊性及功能等一系列问题的答案。芬兰苔藓植物学家约翰尼斯·恩诺斯博士对该书给予了极高评价，他说：“如果您曾为怎样编写苔藓植物的科普读物感到困惑，看看这本书，并以它为例子吧。”

基于读者的期待和过去五年有关苔藓植物研究的新进展和新发现，深澳双方于2013年夏季开始策划对该书的内容进行更新和充实，历经一年半的筹备和编写，于2015年3月在澳门出版了《植物王

国的小矮人——苔藓植物》（第二版）。并在此基础上，携手广东科技出版社推出《植物王国的小矮人——苔藓植物》（中英文版）。

在《植物王国的小矮人——苔藓植物》（中英文版）出版之际，我谨向参与本书编写、设计、出版工作的深、澳、穗三地相关工作人员表示热烈祝贺和衷心感谢！同时，也热切希望深、澳、穗三地充分发挥各自的优势，进一步携手合作，推出更多的研究成果，推动生态文明建设，推进植物科普工作的发展。

深圳市城市管理局局长
王国宾



Bryophytes are probably the humblest members of the plant world and are easily overlooked by people. They are commonly called “green liverworts” in Mandarin, and described in the dictionary as bryophytes are one of the biggest groups in plant kingdom, the plants are generally smaller than most vascular plants, and with rhizoids instead of roots. These tiny plants, low-profile yet somewhat mysterious, were once part of vivid scenery in the eternal exquisite verse: “The doorsteps turned greenish as the traces of moss creeping up, the bamboo curtain suffused bluish as illuminated by the colour of grass” which was portrayed by Liu Yuxi, a poet in the Tang Dynasty, in his masterpiece “An Epigraph in Praise of My Humble Home”.

It is unclear, and difficult to verify, whether this famous verse by Liu Yuxi contributed to any of our current attention and research on bryophytes. However, in this modern civilization, with the advance of the economy, science and technology, and the rising concerns for the environment and ecology, any plant species could be a research subject for specialists. As people have realized that plants indeed play a pivotal role in the ecosystem, no matter prominent or supporting, they are equally significant in nature and for people.

The specialists in Fairylake Botanical Garden of Shenzhen & Chinese Academy of Sciences (Fairylake) have dedicated themselves to bryological research for years and have accomplished a series of achievements, including, the “Bryophyte Flora of Guangdong”, compiled in cooperation with the South China Botanical Garden, Chinese Academy of Sciences, and the “Bryophyte Flora of Macao”, the “Checklist of Macao Bryophytes” as well as “The Miniature Angels in the Plant Kingdom: An Introduction to Bryophytes” that have been published in collaboration with the Civic and Municipal Affairs Bureau (IACM) of the Macao Special Administrative Region. “The Miniature Angels in the Plant Kingdom: An Introduction to Bryophytes”, which was published in 2009, is a popular science book written in traditional Chinese and English for students, teachers, nature lovers and the general public, from which they can find scientific answers to what exactly bryophytes are, how many sub-groups there are in bryophytes, how to tell bryophytes apart from other plants, and what kinds of unique features and functions of bryophytes possess. Dr. Johannes Enroth, a Finnish bryologist, expressed his appreciation in a book review: “If you have ever wondered how to write and compile popularizing books about bryophytes, have a look at this book and follow the example”.

Considering the expectation from readers, and the recent research progress about bryophytes in the past five years, those concerned in both Shenzhen and Macao proposed to update and enrich the book in the summer of 2013. After approximately 18 months of preparation and compilation, the second edition of this book was published in Macao in March 2015. Based on this edition, with the cooperation and efforts of Guangdong Science & Technology Press, a simplified Chinese and English version of the book is accomplished this time to meet the needs of more readers in a broader region.





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杨梅坑是深圳市的苔藓植物多样性中心之一
Yangmeikeng, one of the bryophyte hotspots in Shenzhen

On the occasion of the publication of the "The Miniature Angels in the Plant Kingdom: An Introduction to Bryophytes" (Simplified Chinese and English edition), I would like to extend my warm congratulations and sincere gratitude to all the bryologists, specialists and staff from the Fairylake of Shenzhen, the IACM of Macao and the Guangdong Science & Technology Press for their valuable time and hard work that has been invested in this book. I hope Shenzhen, Macao and Guangzhou will use their respective advantages to cooperate further and accomplish greater achievements to promote ecological civilization and to improve the popular science education on plants.

Wang Guobin
Director
Bureau of Urban Management of Shenzhen Municipality





序_{III}

澳门是一个繁华的都市。在30.3平方千米的土地上，居住着逾63万人，每年迎来约3 000万游客。地狭人稠，日复一日面对车水马龙的繁喧与挤拥，令城市绿地与自然资源显得弥足珍贵。

澳门政府一直致力于保护与提升澳门的自然生态。经过多年来的努力，如今城市绿地率达42%，经鉴定并定名的维管束植物超过1 500种、鸟类近200种、苔藓植物104种，当中包括了首次在澳门发现并以澳门命名的“澳门凤尾藓”。如此丰富的自然资源，正迫切地等待着我们的关怀与呵护！

欣赏大自然之美，人们往往被“树影婆娑，流水潺潺；鸟语花香，蝶舞虫鸣”所吸引，而忽略了自然界中不甚起眼，默默耕耘的小生命——苔藓植物。

苔藓植物矮小纤细，常常披着一身绿衣，静静躺在湿润的林地、树干、石阶或岩壁之上，就像是植物王国的小矮人，鲜少引人注目。其实，苔藓植物是植物界的一个大家族，种类繁多，分布范围很广，在自然界中担当着重要的角色，应用途径亦相当广泛。

澳门特别行政区民政总署为了让大众认识这些矮小而珍贵的自然资源，从2006年



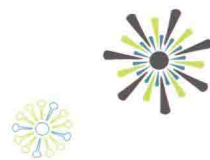
日本立碗藓 *Physcomitrium japonicum*



柔叶真藓 *Bryum cellulae*

开始与深圳市中国科学院仙湖植物园合作，在苔藓植物的研究及科普教育等方面取得了丰硕的成果，先后出版了多本关于苔藓植物的专著，并在深澳两地举办科普展览。其中，在2009年以繁体中文及英文编著而成的《植物王国的小矮人——苔藓植物》一书，广受读者欢迎，出版后不久便售罄。故此，民政总署再次与仙湖植物园合作，在2015年3月出版了《植物王国的小矮人——苔藓植物》（第二版），在原书的基础上进行了修订，增加了更多实用且有趣的资讯，带领读者再次走进苔藓植物的奇妙世界。如今，推出简体中英文版，期望更多地域的读者能受惠。藉着这些书籍，希望读者在认识苔藓植物的同时，亦能体验大自然之美，并触发观察自然、爱护自然、保护自然的原动力和使命感。

澳门特别行政区民政总署
管理委员会主席
黄有力



Located on a piece of land with a total area of 30.3 square kilometres, Macao is a prosperous city which supports over 630,000 residents and attracts about 30 millions of tourists every year. Amid the hustle and bustle of the ever-crowded city, the urban green areas and natural resources are precious.

The Macao Government has been committed to conserve the nature over the years, increasing the green coverage to 42% of the total urban area. There are over 1,500 species of vascular plants, nearly 200 species of birds and 104 species of bryophytes have been recorded in Macao, with *Fissidens macaoensis* being the species of bryophytes first found in Macao from which its name is derived. Such plentiful natural resources are in desperate need of our care and attention.

Dense canopies, ever-rippling water, scented flowers, singing birds, flying butterflies and twittering insects, always make the most eye-catching landscape of the nature beauty that attract the attention of people, while the inconspicuous bryophytes are often overlooked.

Bryophytes are small green plants growing quietly in humid woodlands, on tree trunks and stone stairways, or on rock surfaces. They are like miniature angels in the plant kingdom and are almost always left unnoticed. In fact, they are a major part of the plant kingdom, with numerous species and wide distributions. They play an important role in nature and are widely used for various purposes.

In order to allow the general public to learn about these small but valuable natural resources, the Civic and Municipal Affairs Bureau (IACM) has collaborated since 2006 with the Fairylake Botanical Garden, Shenzhen & the Chinese Academy of Sciences (Fairylake). This collaboration has brought various fruitful results, including scientific research and science education about bryophytes, publishing multiple monographs about bryophytes, and organising science exhibitions in Shenzhen and Macao. The book entitled "The Miniature Angels in the Plant Kingdom: An Introduction to Bryophytes", published in traditional Chinese and English in 2009, was well received by readers and all copies were sold out within a short period of time after being put on shelves. In view of this, in March 2015 the IACM and Fairylake collaborated again to publish "The Miniature Angels in the Plant Kingdom: An Introduction to Bryophytes (Second Edition)", revising its original version and introducing additional content on interesting and practical information to allow readers to explore again the natural wonder of bryophytes. Based on the second edition, we produced this new version in simplified Chinese-English so as to reach more readers from different places, especially in China. It is intended to increase readers' understanding of bryophytes while demonstrating to them the charm of nature, thus promoting their sense of commitment to observing, protecting and conserving nature.

Vong Iao Lek
Chairman of Administration Committee
Civic and Municipal Affairs Bureau of Macao Special Administrative Region

