

地质旅行

Geological Field Trips

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地质出版社



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内 容 提 要

本书是我国第一本专门为大学、专院校学生编写的旅游地质类中英文双语教材。主要介绍了地质学基础知识,包括三大类岩石的特点、地质时代的划分及基本地质构造特征;有关地质景观的成因、特点及与此相对应的中外地质景观的欣赏,最后较为概要地介绍了中国国家地质公园及世界地质公园的分布与景观特征。主要内容体现了人类与资源、环境和谐发展的社会主题,对于向青年学生和大众普及地学知识、指导科学旅游、陶冶情操、保护自然环境、关爱地球等方面可起到较好的指导、宣传和促进作用。

本书主要采用英文书写,每章后附有中文的内容导读,以及重点需要掌握的名词术语解释,是一本难得的地质科普类双语教学读本。

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前 言 (Foreword)

地质旅行, 对于地质、地理工作者来说, 并不陌生。但真正比较系统地讲述这方面的基础知识, 在国内外的出版物中, 十几年前笔者仅见过南京大学夏树芳先生所编的《地质旅行》一书。当时心里立刻产生了要为理、工、农、医、商、文等专业大学生开设这样一门公共选修课的想法。2003 年这一想法终于得以实现, 同时着手准备教材编写的素材。几度寒暑, 几经周折, 如今教材终于得以面呈读者, 心中倍感欣慰。

本课程是为大学生进行素质教育、拓宽知识面而开设的。主要利用石油、地质专业人才及资源优势, 针对近年来越来越热的旅游事业, 向大学生普及地质和旅游知识, 引导他们以科学的眼光看待山川河流等自然地质景观, 了解其特点、成因与地质作用的关系, 并欣赏与领略其间的美学、人文、经济价值。

本教材是第一本为大学本、专科学生编写的旅游地质类双语教材, 既可作为非地质专业大学生公共选修课的教材, 也可作为地质、地理、水文、环境、旅游等专业学生的专业选修课及英中文双语读物或专业英语参考书, 还可作为石油、地矿部门职工专业英语培训教材。

本教材主要由旷红伟在 7 年授课期间积累的多媒体课件及讲义稿汇编而成, 编写、翻译、校对工作持续了 5 年, 并适时增添了一些新的内容。全书共分 3 篇 10 章, 由旷红伟和陈胜教授主编。参加各章节编写的分别是: 序言由旷红伟撰写, 陈胜翻译; 1~5 章由胡瑶整理编写和翻译初稿, 6~10 章由王索整理编写和翻译初稿; 蔡庆翠协助修改、润色并缩编了中文内容导读部分, 名词·术语部分由旷红伟编写; 王西宁协助修改和校译了英文初稿; 章惠协助编译了部分多媒体课件; 长江大学外语学院陈胜教授译校和修订了全部英文; 全书由旷红伟统稿修改。同时参与资料收集、整理、修改、校译的还有尚琼、彭楠、杜冬霞、刘海、徐加林、陈军、王宝红、汪明伟、章朋等, 中国地质科学院地质研究所任留东研究员对本书部分专业术语进行了审校, 以及为本

书提供图片支持的诸位老师、朋友、同学和学生（书中已注明），在此对他们付出的辛勤劳动和大力支持一并表示衷心的感谢。最后，还要特别感谢中国地质科学院地质研究所柳永清研究员对本书出版费用的资助，以及长江大学地物学院董超、夏玲玲老师对本教材的热心支持！

由于时间匆促，水平有限，书中定然还有许多错误与不足之处，文字及个别图片的出处可能还有疏漏，敬请批评指正！

编 者

2012年9月10日



新疆鄯善坎儿其

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Introduction: What Are Geological Field Trips?

Viewed from teaching performances and many other aspects, the bilingual course “Geological Field Trips” has become a public selective course popular with a large number of students, and has brought more than one great benefit: popularizing geosciences among the students, improving the effects of their touring, nurturing their love of nature, cultivating their temperament, and developing their interest in professional English and helping them learn it better.

0.1 The Significance of Geological Field Trips

The geological field trip is not touring people commonly talk about, but “going sightseeing among mountains and waters” (Xia Shufang, 1998) with more or less the purpose of geological, geographical and mineral survey, a high-taste touring characterized by scientific expeditions. In 1864, Jules Verne, a famous French writer of science fiction and adventure, wrote a science fiction *Journey to the Centre of the Earth*, which has aroused numerous people’s interest and delight. In the book, he made a presentation of the latest achievements in geosciences then to popularize basic geological knowledge and fancy the research direction in the future, which has influenced generations of teenagers by stirring up their strong interest in geosciences. In China, there is a book of geography and travels entitled *Xu Xiake’s Travels*, which, in the form of diary, fully reveals fantastic and interesting geographical features of mountains, rivers and lakes in China, especially the karst topography in Southwest China. It has been deeply loved and greatly admired for more than 1,000 years. From the above examples, we can see that people, whether in the ancient times or modern times, whether in China or other countries, were and still are curious about and eager to know all kinds of geographical phenomena. With more and more convenient and advanced information acquisition and communication, more and more miraculous mountains and fantastic waters are presented to people, which stimulates their enthusiasm for the exploration of various geological and geographical mysteries. Contemporary college students possess a strong curiosity and desire for knowledge as well as more chances of travel. Therefore, offering the course “Geological Field Trips” can meet the requirement of the times. It can not only popularize geological knowledge, but also cultivate the students’ virtue of loving nature, preserving the environment and protecting the Earth.

As a Chinese old saying goes, “Travelling ten thousand miles is like reading ten thousand books.” The positive significance is as follows.

0.1.1 Geological Field Trips—an Effective Way of Popularizing Geological Knowledge

Geologists and geographers are familiar with geological field trips, which are the first step to field geological work and a good guide to ordinary tourists in terms of geological knowledge.

However, there are few books published to teach basic geological knowledge really systematically in the way of and from the perspective of “travelling”. If this is done, students’ interest in and enthusiasm for studying geological knowledge can be better stirred up. Modern college students have a wide range of interests, a strong desire for knowledge and more opportunities to travel. They have formed an ideal public science population and environment. It would be a regret not to develop their scientific thinking and interest or help them appreciate the wonder of nature from the perspective of science during their travel. With travelling as a logical point of interest, the course “Geological Field Trips” introduces geological knowledge and natural scenes from a unique perspective and conception of travelling, which makes it possible for students to get familiar with basic geological knowledge of rock composition, geologic genesis and landscaping function while they enjoy the illusive and fantastic beauty created by nature in their travels. This is the most effective way of publicizing basic geological knowledge among students.

0.1.2 Geological Field Trips—a Beneficial Guide to Scientific Tourism

With the persistent development of economy and the steady improvement of Human’s life, especially with the solution of the problem of food and clothing, people will certainly think of improving and enjoying their spiritual life. Taking tours—visiting places of historic interest and exploring mountains and rivers—is one of its important forms. Therefore, tourism has developed rapidly and become an essential part in the third industry, and it has attracted more and more attention from the whole world. On 25th of November, 2009, the Chinese Premier chaired a State Council executive meeting, which discussed and approved in principle *The Opinions on Promoting Tourism Industry*. It is of great and explicit significance for the reorientation and development direction of tourism. *America’s National Geographic Magazine* and National Geographic Channel are popular with the whole world; our country has also launched National Geographic Channel and founded *National Geographic Magazine*; in addition to the usual feature programs about geology, geography and travel, CCTV launched a Travel Channel a few years ago; the number of channels and publications about geology, geography and travel is increasing. At the same time, China’s popularization of science and technology has been developing rapidly. By May, 2012, the number of China’s Global Geoparks approved by UNESCO (the United Nation’s Educational, Scientific and Cultural Organization) and IUGS (International Union of Geological Sciences) has reached 26, and the number of China’s National Geoparks has reached 202. Besides, many geoparks are under construction and are ready for application for approval in China. Scientific tourism is urgently needed for the persistent development of tourism. It is a hot topic how to guide people in their travel, including the improvement in their ability to appreciate natural scenery and the observation of customs and traditions. On the other hand, travelers now are also more eager to know the causes and change processes of fantastic mountains and waters. Therefore, offering the course “Geological Field Trips” can lead students to travel in the form of scientific tourism in the interaction of learning geological knowledge and enjoying natural scenery. If students travel in the form of scientific tourism, they can disseminate the conception of scientific tourism and make it popular. This is of essential significance for the coordinated development of regional environment,

economy, culture and society.

0.1.3 Geological Field Trips—Practical Activities for Temperament Edification, Environmental Preservation and the Earth Care

Students tend to show more interest in the topic of environment in the situation of global warming and frequent natural disasters. In a short time, the course of “Geological Field Trips” can help students understand such important basic knowledge as geology, disaster, environment and scenery and their relationship, acquaint themselves with the classification and the status quo of geological heritage as tourism resources, comprehend the geological conditions and environments which are indispensable to the formation and changes of various tourism resources, and know how to preserve and make full use of all kinds of geological heritage. At the same time, the combination of geological knowledge with geographical and tourism knowledge can arouse students’ interest in geoscience when enjoying scenery, help them learn knowledge in a relaxing atmosphere, and cultivate their noble virtue of caring for the Earth and loving nature and life. In this way, we can hopefully help students to know to cherish good life—to study, work and live with relentless passion.

0.2 The Current Status and Trends of the Research

0.2.1 The Current Status of the Course Construction of “Geological Field Trips”

With the improvement of people’s life, tourism industry has been developing rapidly since 1980s, and it is accompanied by the development of tourism geology, an applied and comprehensive interdisciplinary subject combining geology and tourism, which tries to find out the rules of scenery’s distribution, types, features, causes and changes by applying the relevant theories, technologies and research results of geology. Its development can provide more reliable foundation for the search and evaluation of tourism resources and for tourism plan so that the aesthetic, cultural and scientific values of the scenic areas and scenic spots can be revealed most extensively, together with the causes of the geologic landscapes as well.

With the flourishing development of tourism, the course “Tourism Geology” is offered in tourism schools and a few higher institutions related to geology, e.g. China University of Geosciences (Beijing); “Geological Field Trips” are offered in Nanjing University. “Tourism Geology” is offered to the students who have certain basic knowledge of geosciences and want to learn something about tourism or love to travel. However, there is not a national uniform textbook for these courses. Prof. Xia Shufang at Nanjing University is a pioneer in offering “Geological Field Trips”. The reason why we offer this course is inspired by his popular science book *Geological Field Trips*.

0.2.2 The Current Situation of the Research of Bilingual Teaching

Since the beginning of the 20th century, especially since the end of the Second World War, bilingual education has been flourishing in Canada and America with the economic globalization

and frequent international cultural exchange. It has become an international trend: a lot of non-English speaking countries and areas, e.g. Japan, Russia, Singapore and Hong Kong (China) have offered bilingual education (mother tongue and English), which proves a success. Their researches of bilingual education started early, and they have established mature theories of bilingual education and stable teaching modes, which can be roughly classified as the following.

① Immersion type: It has different connotation in America and Canada, but in our country it means teaching completely in a foreign language, which makes students immersed in the environment of English acquisition. ② Maintenance type: It considers that mother tongue teaching and foreign language teaching are of equal importance. Mother tongue is used for the whole teaching at the beginning and a foreign language is gradually introduced for teaching parts of the course contents. ③ Transition type: It refers to a teaching model that the course contents are taught in mother tongue and the teaching language is a foreign language.

As far as language atmosphere is concerned, China does not lay equal stress on the Chinese language and the foreign language, but instead, the former is the dominant one. In China's higher institutions at present, therefore, bilingual teaching refers to such a teaching model that the Chinese language and the foreign language are used to teach non-language majors' subjects by using original-version foreign textbooks for classroom teaching and only foreign language is used in other teaching activities such as homework, experiments, tests and examinations. For this reason, bilingual teaching in China's higher institutions is more likely to fall into the category of "foreign language teaching" and is defined as "maintenance type" bilingual teaching.

0.2.3 Developing Trend

With the increasing demand for the improvement of Human's living environments and needs for the development of tourism, people will pay more attention to the Earth's resources and the sustainable development in the future. As a result, "Geological Field Trips" and the course "Tourism Geology" have a broad horizon for development. The course can not only be used as specialty basic course for those who are related to geosciences, but also be used as a guide for people's scientific tourism, enabling them to realize the aesthetic value of scenery's elegance for appreciation and at the same time to understand its special scientific significance and scarce natural quality. "Geological Field Trips" can help people to integrate natural landscapes with human landscapes, understand their ecological, historic and cultural value. On the one hand, it can provide people with sightseeing of good scientific taste, promote geologic heritage and raise public awareness to care for and protect the Earth. On the other hand, it can put forward some suggestions and new ideas about feasible methods for supporting local sustainable development with economic, cultural and environmental harmony. Besides the contents mentioned above, everything that is relevant to both geosciences and people's life can be taken into the course. As an interdisciplinary subject, it overlaps many subjects such as geomorphology, mineral resources assessment, physical geography, economic geography, environics, even archeology, medicine, pharmacology and agronomy. Teaching "Geological Field Trips" and other courses bilingually is still at the starting stage in our country. Therefore, there is broad scope for its growth in the extensiveness of contents

and its methodology.

0.3 Course Contents

By making use of the advantage of talents and resources in geology—the major specialty of petroleum field, this project is mainly aimed to popularize geologic and tourism knowledge among college students, who are expected, through this course, to view natural geologic landscapes and waterscapes from a scientific perspective, understand their features and geologic genesis, appreciate the aesthetic and human-economic values, and cultivate their own noble sentiments of loving and caring for nature.

This book consists of the following three aspects.

The first is the basis of geology, including the characteristics, the division of geologic time and basic geologic structures of the three major rock types. The second is about causes and features of geologic landscapes and waterscapes, and the appreciation of these scenes both home and abroad. The third is the brief information about geoparks.

内容导读

“地质旅行”双语课程从教学实践和各方面反映看,无论是对地球科学知识的普及和旅游水平的提升,或是对自然的热爱、性情的陶冶及对专业英语的熏陶与掌握,都在学生群体中收到了很好的效果,成为一门广受欢迎的公共选修课。

► “地质旅行”课程的意义

所谓“地质旅行”并非人们常说的旅游,而是带有一种研究或考查地质、地理、矿产等目的的“游山玩水”(夏树芳,1998),是一种带有科学考察性质的高品位的旅游。法国著名科幻和冒险小说作家儒勒·凡尔纳曾有一部科幻小说《地心游记》(1864),100多年来为无数人津津乐道。作者以游记形式介绍当时的地学研究最新成果,普及地质基础知识,幻想未来的研究方向,影响了许多代青少年,激发了他们对地学的浓厚兴趣。中国也有本地理学游记——《徐霞客游记》,以日记体的形式较为全面地展示了我国各地,特别是西南岩溶地区奇异有趣的山川、湖泊等地理现象,1,000多年来深受人们的喜爱和推崇。可见古今中外,人们都对自然界中各种地理现象充满了好奇和求知欲。当代社会,由于信息非常发达,全世界范围内的奇山异水更多地呈现在人们面前,进一步刺激了人们探究各种地质奥秘和地理现象的热情。现代大学生的好奇心和求知欲都非常强烈,外出的机会也越来越多,因此开设“地质旅行”课程顺应了时代的需要,不仅能普及地学知识、指导学生开展科学旅游,而且能更好地引导学生陶冶情操、热爱自然、保护环境、爱护地球。

1. 地质旅行是普及地学知识的有效途径

地质旅行通常是野外地质工作的先行,其中所包含的地质知识对一般的旅游者来说也具有指导作用。以“旅行”的方式和思维开展地质科学知识的普及,更能激发学生的学习兴趣 and 热情。现代的大学生兴趣广泛,求知欲强,而且外出旅行的机会越来越多,已形成

了一个很好的科普群体和科普环境。如果不及时引导他们在观光之余培养科学的思维和兴趣,以科学的角度去欣赏大自然的神奇,不能不说是件憾事。而“地质旅行”这门课程以旅行兴趣为切入点,运用旅行的独特视角和思维介绍地学知识和自然景观,使学生在欣赏大自然鬼斧神工的美景中,了解有关地质景观的岩石组成、地质成因、造景功能等基本地学知识,这是对大学生进行地学常识普及的最有效途径。

2. 地质旅行是对科学旅游的有益指导

随着经济的不断发展,人们物质生活水平的逐步提高,人们就会想到提高精神生活的享受。游山玩水,游览名胜古迹,寻访名山大川就是其中很重要的一种形式,因此,旅游事业得以迅速发展,旅游业已成为当今经济结构中第三产业的重要组成部分,为各国所重视。2009年11月25日,国务院总理主持召开国务院常务会议,讨论并通过了《关于加快发展旅游业的意见》,对旅游业的重新定位和发展方向具有重要而明确的指导意义。《美国国家地理》杂志和国家地理频道受到全世界的欢迎和热爱;我们国家也开设了国家地理频道、创办了《中国国家地理》杂志等;中央电视台近年来开通了旅游科教、记录频道等,无不与此相关;与地质、地理、旅游有关的各种网站、书籍和文献也越来越多。同时,中国地质科普工作得到了飞速发展,截止到2012年5月,由联合国教科文组织(UNESCO)和国际地科联(IUGS)批准通过的中国世界地质公园已达26个,中国国家地质公园已达202个,而且许多地质公园正在兴建与报批之中。科学旅游成为了旅游业可持续发展的迫切需要。如何指导人们去游山玩水,提高欣赏山水的能力与水平,已成为当今社会的热门话题;而在旅游中,对奇山异水的形成原因及其来龙去脉也日趋成为人们更想了解的内容。因此,开设地质旅行课程,能在学习地质知识与景观欣赏相互联系的过程中指导学生进行科学旅游。学生懂得了科学旅游,今后就能宣传科学旅游,使科学旅游得到普及,这对促进区域环境、经济、文化和社会协调发展有着非常重要的意义。

3. 地质旅行是陶冶情操、保护自然环境、关爱地球的实践行动

在当今全球气候变暖、自然灾害频发的形势下,学生对环境话题具有更加浓厚的兴趣。本书可以使学生在较短的时间内了解地质、灾害、环境、景观等重要基本知识及其相互关系,掌握能作为旅游资源的自然地质遗迹的分类及现状,认识各类自然旅游资源的形成和变化所必须具备的地质条件和地质环境,懂得如何保护并充分利用各类地质遗迹资源。同时将地质知识与地理、旅游知识相结合,让学生在欣赏风景的同时,激发他们对地学的兴趣,在轻松的气氛中学习知识,培养他们关爱地球、热爱大自然、热爱生活的高尚情操,并以此为契机,让学生懂得珍惜美好的生活,以更饱满的热情去学习、工作和生活。

► 目前国内外研究现状、发展趋势

1. 地质旅行课程建设现状

自20世纪80年代以来,随着人们生活水平的提高,旅游业的蓬勃发展,旅游地质学也随之兴起。它主要运用地质学的有关理论、技术和成果,探讨有关景点的分布、类型、特征、成因和变化的规律,是地质学与旅游学相结合的一门应用性、综合性很强的边缘学科,它的发展可为旅游资源的寻找、评价和旅游规划提供更多依据,以便最大限度地展现景区和景点的美学、文化与科学价值,同时也可向人们展示更多自然地质景观成因方面的知识。

随着旅游事业的蓬勃发展,与旅游有关的许多大、中专学校都开设了“旅游地质”课程,少数地质院校如中国地质大学(北京)等开设了“旅游地质学”课程,南京大学开设了“地