中国古鸟类图鉴

PICTURE BOOK OF CHINESE FOSSIL BIRDS

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序

世界第五届古鸟类与进化会议即将在我国召开。为此次盛会提前撰写绘制的《中国古鸟类图鉴》也将出版发行。这部古鸟类图鉴，据我所知是目前国内介绍我国关于中生代鸟类的研究成果以及世界关于鸟类起源和飞行起源争论最全面、最细致的一部图鉴，必将使广大读者感到兴趣，从中得以教益。

特别是我们研究所负有盛名的艺术家和其他著名画家合作，先把本书所有被页岩压扁的鸟，按骨骼构造生动地站起来；继由杨恩生、曾孝濂和侯晋封先生添上肉体和羽毛；再根据同类鸟类推测染成颜色，这岂不成了使人爱看的一本书！我相信这本书面世之后会有人说长道短，也许有人会问颜色的根据是什么？遇到这样的问题，可用恐龙的复原来回答。幼年玩鸟的时候，我即知道近水的鸟尾多较短，树上生活的鸟尾多较长。鸟类研究者知道得十分清楚。本书作者对这些问题也会进行详细研讨。我相信这几位作者遇到读者的建议，不会护短，是能虚心接受的。

中国科学院院士 贾兰坡

2000年3月8日

PREFACE

The 5th International Symposium of the Society of Avian Paleontology and Evolution will be held in China this summer. I am glad that the picture book of Chinese fossil birds will be published as a special gift for the meeting. As far as I know this is the most comprehensive book in China about the study of Chinese Mesozoic birds and the discussion of the origin of birds and their flight. It should be both interesting and educational for readers.

It is particularly meaningful that this book was the joint efforts by the well-known artist at the IVPP with other distinguished painters. They first vividly reconstructed the skeleton from the shale, and then dressed them with fresh and feathers. Finally color was added. What else can we expect from a book like this? I believe that the publication of this book may incur some controversy. People might wonder how the color was chosen. Such question can be answered with reference to the reconstruction of dinosaurs. When I was bird-watching as a kid I realized that water birds normally have short tails, arboreal birds usually have long tails. Ornithologists are more familiar with this knowledge. The authors of this book will go to details about such questions. I am sure that they will also be ready to listen to any suggestions or criticism from readers.

Jia LanPo

2000.3.8

前言

鸟类是一形态特殊与人类关系密切的脊椎动物群。现生鸟类计9000余种，个体大小不等，形态各异，是唯一能占领三维空间的繁盛的一支脊椎动物。然而由于它们善于飞翔，活动能力强，骨骼又轻，不易在地史时期留下痕迹，更不易为人们所发现，故对鸟类的进化历史和鸟类的起源知之甚少。中国近年来大量发现产自陆相中生代地层的早期鸟类化石，在国际上引起了强烈反响，被一些著名学者誉为本世纪脊椎动物化石研究的最重大发现之一，尤其孔子鸟的发现被美国《发现》杂志引为1995年世界一百条重大科技新闻之一。中国的这一发现，不仅为探索鸟类起源提供了极其珍贵的证据，而且填补了鸟类进化过程中的若干空白。

达尔文的惊世之作《物种起源》(On the origin of species)(1859)问世刚两年，1861年，德国巴伐利亚索罗霍芬地区晚侏罗世海相泻湖沉积中发现了始祖鸟(*Archaeopteryx*)化石，震惊了全球整个学术界。始祖鸟以它那绝妙的爬行动物和鸟类的中间的中间类型的特征，验证了生物进化理论的正确性。1879年，始祖鸟的第一件生态复原简图由Carl Vogt绘制出来，1926年由Garhard Heilman绘制出首幅始祖鸟生态全景图，复原图使人们更加深了对始祖鸟的了解。始祖鸟化石发现后不到20年，北美相继发现了

中生代最晚期的绝灭鸟类——黄昏鸟(*Hesperornis*)和鱼鸟(*Ichthyornis*)化石，前者为一类大型潜水鸟类，而后者则是一类特殊的滨岸鸟类。这两种鸟类的生态复原图也很快被科学家和艺术家合作绘制出来，连同始祖鸟的生态复原图一直被学术界和教科书引用。

关于鸟类起源和飞行起源的重大命题，100多年来，几代科学家就这样围绕着始祖鸟、黄昏鸟和鱼鸟等这些少数中生代鸟类化石，特别是几块始祖鸟化石不懈地进行着探讨。但由于始祖鸟的形态特征与黄昏鸟、鱼鸟和现生鸟类的解剖构造相差太远，而新材料又发现极少，尤其是自侏罗纪中晚期地球大部分区域受海浸的影响，陆相沉积很不连续，因此世界最早的鸟化石除德国外，几乎没有在其他地区被发现。因为始祖鸟的骨骼特征还有许多爬行动物的性质遗留，于是首先由赫胥黎[T.Huxley(1868)]依据与始祖鸟同一产地出现的一小型兽脚类恐龙——美颌龙（*Compsognathus*）和始祖鸟的相似构造，提出鸟类起源于恐龙的假说。假说提出不久美颌龙的生态复原图也被绘制出来，更增加了人们对鸟类起源于恐龙的印象。

在赫胥黎提出鸟类起源于恐龙假说的10年之后，B.F.Mudge（1879）以《Are birds derived from dinosaurs?》为题对赫氏观点提出质疑，认为恐龙出现的时代太晚，而且它们又是一群高度特化的动物，并进而提出鸟类起源于早期槽齿类爬行动物的假说。从此揭开了关于鸟类起源学说争论的序幕。不久南非在早三叠世地层中发现了一小型槽齿类化石——派克鳄（*Euparkeria*）并被认为是解决鸟类起源的关键化石。故而其骨架和生态图也很快被复制出来。这样，古生物的生态再造图，不但被用来为恢复生物生活时期的本来面貌和当时的生态环境服务，还被用来为学术观点的确立服务。

1984年中国第一块中生代鸟类化石研究报告的发表，为鸟类早期演化带来了新的希望，为学术界广泛关注，也为始祖鸟不是现生鸟类直系祖先提供了新的证据。近年来我国北方地区，特别是辽宁西部地区发现的侏罗——白垩纪鸟类化石，不论从数量和种类方面都远远超过了世界同期的总和，尤其是与鸟类共生的大量不同类型的带毛状物的恐龙相继被发现，给鸟类起源的争论增加了强有力的“炮弹”。成为学术界关注的热点。

为什么中国北部地区（包括辽西）会保存有这么多完美的早期鸟类、带毛状物的恐龙和其他许多在生物起源和进化中起关键性

作用的化石呢？这是广大读者和人们十分关注的问题。回答这一问题在这一简短的前言中是不可能使人们满意的。概要的解释是：中国北部及其他东亚地区，从三叠纪起陆相地层呈连续沉积，给生物的发生和演化提供了有利的基础。到晚侏罗世——早白垩世，东亚地区（包括中国北部）气候温暖湿润，河湖星罗棋布，植物异常繁茂，给动物的发生发展创造了得天独厚的生态环境，当时辽西地区尤其明显。包括辽西在内的中国北部地区当时火山爆发频繁，使小环境处于动态之中，更宜于新物种的发生。所以在辽西相继发现了华夏鸟（*Cathayornis*）、中国鸟（*Sinornis*）、朝阳鸟（*Chaoyangia*）和波罗赤鸟（*Boluochia*）等等，在内蒙发现了鄂托克鸟（*Otogornis*）等一大批早白垩世鸟类。这些鸟类化石都是在河湖相沉积地层中发现的。有意思的是，当中国发现大量早期鸟类的消息报道发表后，加拿大恐龙专家Philip J.Currie（1991）在其所著的《The Lying Dinosaurs》一书中就由Jan Soak第一位将辽宁发现的早白垩世小型鸟类的生态图复制出来了。而正式研究论文是1992年发表的。可见学者和艺术家对新发现反应的迅速和敏锐。

1995年以来，我们不断报道发现于我国辽宁西部地区晚侏罗世地层中的孔子鸟（*Confuciusornis*）类化石。它是已知最早有角质喙的鸟类。其时代及原始性等都仅次于始祖鸟，它是最早的陆相沉积地层中发现的原始鸟类。它的形态特征区别已知所有中生代鸟类，它是迄今中生代鸟类具有双弓型头骨最明显的鸟类，充分证明鸟类是起源于双弓型头骨的爬行动物，最早和最庞大的双弓类爬行动物是初龙类（Archosauria），恐龙也是由早期的初龙类演化而来的。1996年，纽约时报一位记者首先试图给孔子鸟复原一生态图，孔子鸟的正式生态复原图见于1996年A.Feduccia）的巨著《The origin and evolution of birds》一书中，由John P.O'neill所绘，这幅画绘的很妙，因为孔子鸟的正型标本是一件不全的个体，仅有骨头和前肢，副型标本为一腰带和后肢，故生态复原图给了一只爬在树杈上的孔子鸟，除头和前肢，身

体其他部分全被树干所遮避。它既反映了当时化石发现的真实性，又将孔子鸟嘴上有角质喙而没有牙齿，前肢指爪特别大，抓握能力很强的生态特征表现出来了。在同一部书里，我们还看到了由P.O'neill为我国第一块中生代鸟类化石——甘肃鸟（*Gansus*）绘制的生态复原图。1999年，再版的A.Feduccia《The origin and evolution of birds》一书的封面，由H.Douglas Preatt绘制的雌、雄孔子鸟的生态复原图，是我国古鸟类的首幅彩色正式出版的生态复原图，迄今为止，我国发现的两大中生代鸟类群：孔子鸟类群和华夏鸟类群，其种类已超过20种，分属于蜥鸟亚纲（Sauriurae）和今鸟亚纲（Ornithurae），尤其是孔子鸟类群包括孔子鸟、辽西鸟、始反鸟和辽宁鸟等4大类型不同形态的庞大鸟类群，不论从学术考虑，还是从科学普及教育着想，都亟待将这些鸟类的生态原貌复制出来。

从以上简单介绍已知，我国少数重要的中生代鸟类生态复原图全是国外科学家和艺术家合作复制的。但是，毕竟他们对化石本身及其共生生物群，当时的地理、地貌等生态环境了解得不全面，故如果我们自己将我们研究的鸟类其生态面貌复原起来，就会方便得多。而且我国不但有丰富的中生代鸟类群，还有更多、时代更复杂的新生代鸟类化石，从更新世上溯到古新世都有鸟类化石发现，也有一批研究成果面世：如北京猿人遗址及周口店地区的鸟类化石、辽宁金牛山猿人产地鸟类化石和四川巫山猿人遗址鸟类化石等，再如山东山旺、江苏泗洪和云南禄丰等三个中新世鸟类群，还有河南、湖北、新疆等地区始新世的鸟类化石，特别是安徽潜山、陕西洛南古新世鸟类的研究引起了人们广泛关注。另有许多新生代鸟类化石正待研究。

所以，出版一套中国古鸟类化石图鉴，系统全面和生动地介绍中国20世纪古鸟类研究的成果，是国内外学术界和广大人民群众所期盼的，我们也知道这是一项非常艰巨的系统工程，不但需要对已研究的古鸟类成果进行系统的整理，还需要大量化石产地的地质和生物资料。最重要的是有兴趣于古生

物生态复原的艺术家来掌握和理解这些资料，对他们来说这是一项极其艰苦又陌生的工作。

记得，1998年在北京中国美术馆与侯晋封先生一起参观曾孝濂教授的百鸟画展时，我期望多年的古鸟类生态复原忽然有丝光亮！参观后，侯晋封先生引见、拜会了曾教授，谈话中我将希望有兴趣的画家为我国众多的古鸟类绘制生态复原图的心愿说了出来，曾教授听后很感兴趣。从那时起侯晋封先生一直在刻意策划此事，侯先生是我们研究所资深艺术家，他特别对古鸟类的复原有兴趣。他在职时很大一部分时间为我所研究的鸟类化石绘插图，他对古鸟类具有较常人更深入的了解。1999年，曾教授认识了世界著名的美籍华人画家杨恩生教授，并向杨先生介绍为中国古鸟类绘制生态复原图的事，使我高兴的是，杨教授不但愿意为中国古鸟类创作生态复原图，而且还积极筹集资金，全力资助《中国古鸟类图鉴》的出版！就这样，由杨恩生、曾孝濂、侯晋封等三位著名艺术家，周忠和博士英语翻译和本文作者一起五人组成《中国古鸟类图鉴》工作组。

为了在2000年5月底到6月初在北京召开的，由中国科学院古脊椎动物与古人类研究所主办的世界第五届古鸟类与进化会议之前，将图鉴印出来，我们先出版《中国古鸟类图鉴》上册，全为蜥鸟亚纲的中生代鸟类，共计16种（包括德国的始祖鸟）。杨恩生先生绘9种，曾孝濂先生在侯晋封先生协助下绘6种，侯晋封先生绘1种。在生态图复绘之前，在侯连海的协助下，侯晋封先生首先将每一种鸟的骨骼复原草图绘制出来，供生态复原之用，因为每一种鸟化石的骨骼都不相同，埋藏的状况也各不相同，多少都有一些骨骼破损和缺失，所以必须首先依据每一种鸟的骨骼特征、个体大小和生态习性等，将其骨架复原出来，才便于画家设计生态复原图，这一工作既单调又困难，侯晋封有经验，非他莫属。基础工作做好了，再参考我们野外在与鸟类同产的其他生物化石，在科学家的指导下，发挥艺术家们的天才技艺，中国，也是世界第一部古鸟类图鉴才能与世人见面。

中国古鸟类图鉴出版之后，即着手今鸟亚纲的古鸟类图鉴的编绘工作，图鉴的每一种鸟有三幅图：鸟化石的彩色图版，骨骼复原图和彩色生态复原图。每一种鸟都有中英文的说明，主要注明产地、时代和特征等。这样既能满足国内外广大读者的需要，又能满足国内外科学工作者和教育工作者等的参考和教学之用。这是一项史无前例的开创性工作，缺点在所难免，希望读者批评指正。

这里还有一点要说明的是，锦州文雅博物馆馆长知道我们这项工作后也表示大力支持并且邀请我们的全体人员参观他博物馆的珍藏，使我们的艺术家们大开眼界，收集了不少对生态复原有关的资料，真实做到了从各方面资助我们的工作，在此仅表示衷心的谢意。

在图鉴的最前面有我国著名古生物学家，中国科学院院士贾兰坡先生为本书写的序言，贾老已 90 有余高龄，对他热情支持这一工作，我们深表感谢之情，并祝老先生健康长寿！

这本书是国家自然科学基金重点项目“辽西热河生物群研究”和中国科学院创新工程的成果之一，课题号分别是 4982020 和 K2951-B1-410。

我们对台北市生态艺术协会、华新丽华股份有限公司、华邦电子股份有限公司的大力支持、赞助，表示衷心感谢。张杰先生为本书摄制化石照片，辽西鸟图版由邓东兴先生摄制，在此一并致谢。

侯连海

2000 年 3 月 20 日

INTRODUCTION

Birds are a group of vertebrates that have a particularly close relationship to human beings. Modern birds are made up of about 9000 species of various size and morphology. They are the only vertebrate group that can occupy three-dimensional spaces. Because they are light-boned, volant and able to move quickly they are generally hard to be preserved as fossils, thus the history of birds and their origin are largely unknown to us. Recently, abundant Mesozoic birds have been recovered from the terrestrial deposits in China. These finds have been regarded by many distinguished scholars as one of the most important vertebrate discoveries of the 20th century. The discovery of *Confuciusornis* was selected by the "Discover" magazine as one of the 100 scientific news of 1995. The findings in China not only provided invaluable evidence for studying the origin of birds but also filled many gaps in the evolutionary history of birds.

In 1861, only two years after the publication of Darwin's great book "On the origin of species", *Confuciusornis* was discovered from the Late Jurassic marine deposit in Solnhofen of Germany. This discovery stunned the world. The first life reconstruction of *Archaeopteryx* was made by Carl Vogt. In 1926, Garhard Heilmann painted the first comprehensive life reconstruction of *Arhcaeopteryx*, which had helped readers better understand this ancient bird. Less than 20 years after the first discovery of *Archaeopteryx*, *Hesperornis* and *Ichthyornis* were discovered from the latest stage of the Mesozoic deposit in North America. The former is a large diving bird and the latter a specialized shore bird. The life reconstruction of these two birds was produced by artists and scientists shortly later. These life reconstructions together with that of *Archaeopteryx* have since been widely used in scientific papers and textbooks.

The study of the origin of birds and their

flight have been centering on a few limited early bird materials such as *Archaeopteryx*, *Hesperornis* and *Ichthyornis*. However, *Archaeopteryx* is already very different from *Hesperornis, Ichthyornis* and modern birds. Besides, the new material was also seldom discovered. Because of the sea expansion during the middle and late Jurassic the terrestrial deposits is discontinuous, therefore earliest bird has not been discovered from any area outside Germany. Because *Archaeopteryx* still retained many of the primitive reptilian skeletal characters Huxley (1868) first proposed the dinosaurian origin of birds based on the similarity between *Archaeopteryx* and the small sized theropod *Compsognathus* from the same horizon. A life reconstruction of *Compognathus* was finished shortly after the hypothesis was proposed, which help publicize the dinosaurian origin of birds.

About 10 years after Huxley proposed the dinosaurian origin of birds, Mudge (1879) argued in his paper "Are birds derived from dinosaurs?" that dinosaurs appeared too late and too specialized to be ancestral to birds, the ancestor of birds should be found in early thecodont reptiles. His thecodont hypothesis of the origin of birds marked the beginning of the debate on the origin of birds. A small sized thecodont *Euparkeria* was soon discovered from the Triassic deposit in South Africa. This fossil was acclaimed as one of the key evidence for studying the origin of birds, therefore its skeletal and life reconstructions were soon published. Life reconstructions have not only been used as an indication of the paleoenvironment but also help explain the scientific theory.

In 1984, the discovery of the first Chinese Mesozoic bird brought new hope for the study of early evolution of birds. It had not only drawn the attention of scientists but also provided evidence that *Archaeopteryx* was probably not the direct ancestor of modern

birds. The Recently discovered early birds from northern China, particularly in western Liaoning Province, outnumbered the total from other countries in both amount and types. In addition, the discovery of feathered dinosaurs from the same horizon has stimulated hot debates on the origin of birds.

Why could so many beautiful early birds, feathered dinosaurs and other important fossils have been preserved in northern China? This is a very intriguing question for many readers. It is probably impossible to provide a satisfying answer in a space-limited preface. To summarize, since Triassic age there existed continuous terrestrial deposits in northern China and other East Asia areas. By the time of Late Jurassic to Early Cretaceous, it was warm and humid in East Asia, many lakes were present surrounded by abundant plants, which provided the ideal background for animals to grow and life. This is particularly true in western Liaoning. Another factor is that volcanic activities were frequent in western Liaoning, the micro-environment was kept in turbulent situation, which was advantageous for the genesis of new species. Therefore in western Liaoning, many birds such as *Cathayornis, Sinornis, Chaoyangia*, and *Boluochia* have been discovered. Early Cretaceous bird *Otogornis* was discovered in Inner Mongolia. All these birds were from the lacustrine deposits. It is interesting that Jan Soak published the first life reconstruction of Chinese Early Cretaceous bird in the book "The lying dinosaurs" by Canadian dinosaur expert Philip J. Currie (1991) shortly after the news of the finding of early birds in China was spread out. However, the research papers of these birds were published in 1992. This story reflects the insight of scientists and artists about the new discovery.

Since 1995, we have reported the discovery of the *Confuciusornis* fossil from the

Late Jurassic deposits in western Liaoning Province. This is not only the oldest known beaked bird but also second only to Archaeopteryx in both primitiveness and age. It represents the oldest record of fossil birds from the terrestrial deposits. It is also the only Mesozoic bird with an obvious diapsid skull, further confirming that birds were derived from diapsid reptiles. The oldest and most diversified diapsid reptilian group is Archosauria. Dinosaurs were derived from archosaurs too. In 1996, a reporter of the New York Times first reconstructed the life of *Confuciusornis*. The formal publication of life reconstruction of *Confuciusornis* appeared in Alan Feduccia's famous book "The origin and evolution of birds". It was created by John P. O' neill. This was a piece of masterful work. At that time *Confuciusornis* was represented only by a skull, forelimbs in the holotype and pelvis and hindlimbs in the paratype, the bird was reconstructed by the artist as perching in a tree, the skull and forelimbs were exposed and the rest of the body were covered by the tree, therefore this reconstruction scientifically reflects what we really knew about *Confuciusornis* at that time. On the other hand in that reconstruction important features of *Confuciusornis* such as the presence of horny beak, loss of teeth, large wing claws, strong perching capability were expressed in great details. In the same book, P. O'neill also reconstructed the life of another Chinese Mesozoic birds, *Gansus*. In the second edition of Feduccia's book: "The origin and evolution of birds", the cover is a life reconstruction of male and female *Confuciusornis* by H. Gouglas Preatt. It also represents the first color life reconstruction of any Chinese fossil bird. Until now, there are more than 20 species of birds discovered from the *Cathayornis* avifauna and the *Confuciusornis* avifauna. These birds can be referred to Sauriurae and Ornithurae respectively. The *Confuciusornis* avifauna is

composed of four important types of birds including *Confuciusornis*, *Liaoxiornis*, *Eoenantiornis* and *Liaoningornis*. Life reconstructions of these birds are desirable for both academic and educational purposes.

As briefly introduced above, the important life reconstructions of Chinese Mesozoic birds were all created by scientists and artists abroad; However, because they usually were not very familiar with the fossils and the associated biota, the paleogeography and paleoenvironment, therefore it should be more convenient for us to do such a job. Besides, we not only have abundant Mesozoic fossil birds but also have more Cenozoic birds ranging from Paleocene to Pleistocene, part of which has already been published, including the Pleistocene birds from human sites in Choukoudian in Beijing, Jinniushan in Liaoning Province, and Wushan in Sichuan Province. Besides, three Miocene sites have also been reported in Shanwang, Shandong Province, Sihong, Jiangsu Province and Lufeng, Yunan Provicne, respectively. Eocene birds have been found from Henan, Hubei, Xinjiang, and Paleocene birds from Anhui and Shanxi. More important Cenozoic birds remain to be studied.

To publish a series of picture books of Chinese fossil birds and systematically introduce the achievements of the Chinese paleornithological study in the 20th Century have been expected by our colleagues and the public for a long time. We realize that this is a challenge because we not only have to prepare detailed geological and biological data but also need the cooperation of talented artists to be committed to this work.

Back to 1998 when Mr. Jinfeng Hou and I were attending the "Hundred Bird Exhibit by Xiaolian Zeng" in Beijing, the idea of such cooperation came to my mind. Shortly we exchanged ideas with Mr. Xiaolian Zeng about such a book. Later, Jinfeng Hou began

to seriously consider this plan. He has been a professional scientific illustrator for many years. He has spent a large chunk of his time working on illustrations of fossil birds with me at the IVPP. In 1999, Prof. Zeng met the world-known Chinese American painter Prof. Anderson Yang, he introduced to him the book we had been planning. Fortunately, Prof. Yang was so attracted by such an idea that he began to seek for publishing fund to support this book. Since then, the three artists and I began to formally work on this book. We also invited Dr. Zhonghe Zhou to translate the Chinese language into English.

In order to publish this book before the 5th International Symposium of the Society of Avian Paleontology and Evolution (1-4 June 2000) organized by the IVPP, we decided to publish part one of the book that only includes sauriurine birds with a total of 16 species (including *Archaeopteryx*). Nine of them were made by Anderson Yang, six by Xiaolian Zeng and one by Jinfeng Hou. Jinfeng Hou prepared all skeletal reconstructions of these birds with my assistance. This is important because all fossil birds were preserved differently due to different preservations. Without such a skeletal reconstruction it is impossible for the artists to create a correct life reconstruction of these early

birds. Mr. Jinfeng Hou is an experienced artist, he has referred to a lot of fossils associated with the birds before taking up these basic work.

After the first part of the book is published, we will continue to work on the second part, mainly on the ornithurine birds. Each bird is represented by three parts in this book, one is the color picture of the specimen, the second is the skeletal reconstruction and the third is the color life reconstruction. Each bird is accompanied by both Chinese and English explanations including locality, age and other information. Hopefully this will make this book readable to the public, educator and scientists. This is a pioneering work in China, we look forward to hearing the critical comments from readers.

We should thank the director of the Wenya Musuem in Jinzhou City. He invited all the authors to visit his collection that helped us collect a lot data useful for the reconstruction work.

We would like to pay our special tribute to Mr. Lanpo Jia, a distinguished Chinese paleontologist who had written the preface for this book . This book was part of the result of the Chinese Academy and NSF co-sponsered project "Study of Jehol Biota" (K2951-B1-410 and 4982020, respectively). Mr. Jie Zhang took pictures of all specimens.

Finally we are indebted to Taipei Eco-art Association,Walsin Lihwa Corporation, and Winbond Corporation for funding the publication of this book.

Hou LianHai

来自侏罗纪的呼声

中国中生代鸟类绘图之心路历程

当1999年夏天，中国科学院古脊椎所侯连海教授与昆明植物研究所曾孝濂教授约我画中生代鸟类时，我并不完全明白这项任务的困难所在，只因我实在喜欢鸟类，也画了12年的现生鸟类——包括台湾、阿拉斯加、南美洲、澳洲、英国……等地，但侏罗纪与白垩纪的鸟类，倒是未曾听闻过。

一开始，我到北京，由侯教授为我上了几天的速成课程，包括出土的鸟类、爬虫类、植物的化石，及这些史前鸟类的骨骼、羽毛及结构……地质史。初听之下，既新奇，却又遥远陌生，一边写笔记，一边提出浅显幼稚的疑问。回到美国洛杉矶家中，只剩大约45天，却须完成9幅作品。头先的一个礼拜，根据侯教授的著作，一一整理出头绪，针对鸟名、分类系统、体长、地质时期、生态习性、初级飞羽数目列出一个备忘录，再根据这份备忘录所提供的重点，画出了九种鸟类的铅笔草图，缩小后传真给侯教授审核，标示意见后再回传给我，这就花去了十多天。正式作画时，发现了更多的疑问，一边画，一边恐惧战兢——到底画对了没？这些疑问，对于一个非生物科班出身的我而言，真是一场数不尽的恶梦，似乎永远没完没了。以下列举一些当时令我极度困扰的难题：中生代鸟喙上的鼻孔，应开于前方或后方，