

中国金属技术史

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田长浒 著

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序

席文

(美国宾夕法尼亚大学,
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近年来,科学史已经形成了一门学科,在全世界它拥有成千的专业研究人员,上百个科学史系和许多学会。它变得如此的重要是因为随着科学和技术的继续发展,客观地评价科技的过去就显得更为迫切,以便更为明智地规划其未来。由于为发展所付出的代价在持续的增长,即使最富有的国家也再不能为一再重犯过去的错误而浪费资源了。

在世界上的一些地区,现代化已给传统文化带来了巨大的冲击,另一方面新的和老的又彼此丰富,对不同环境下技术和社会变革的对比研究提供给发展中的国家一个选择最有效途径的机会。

半个多世纪以来,由于中国历史学家长期所作出的贡献以及世界上其他国家学者们在传播这方面知识的近期著作,使得研究中国的科学、技术和医学成为科学史中的一个重要部分。

各地的有识之士现在都意识到了科学和技术革命曾是世界

各地所取得发现和发明的产物。这些革命之所以成为可能，是因为“思想和方法”从中国、伊斯兰国家和印度，特别是在文艺复兴时期自由地传入了欧洲，因此我们认识到思想和方法在中国和欧洲的自由交流是加速西方发展的重要条件。

在科学史内已形成的专门问题中，最重要的领域之一是考古冶金，它关系到发现古代金属和金属制品制造所采用的工艺过程。由于古代金属制作的精湛技术，所以它的产品一直是研究的重要对象。

在考古冶金方面的外国专家，澳大利亚的Noel Barnard，美国的Cyril Stanley Smith、Robert Maddin 和 Michael Notis 等在过去的十年中已与中国这方面最主要的学者，如柯俊、田长浒、华觉明等保持着密切的联系。他们的以及其他国家的实验室已经在一起分担研究任务和分享成果。

早就十分需要一本中国古代冶金这样的通史来介绍当前的研究进展了。在过去两年里，柯教授和华教授已主编了有关的论文集，这些论文集很好地总结了某些领域的近期研究成果。田长浒教授现在又出版了这本综合性的技术史。本书有两大优点：第一是忠实地综合了许多学者的研究成果；第二是展示了田教授自己的思想。田教授是一位非常博学的学者，在实验研究上也是很有经验的，他把深刻的探索的思想和清晰的阐述结合了起来。

这是一本所有古代金属的技术史，而重点是青铜和铁器，它包括了从采矿到退火的金属冶炼过程。田教授联系到金属在农业、军事和其它方面的应用。他的研究不仅限于技术方面，并以丰富的文献资料和考古学家的发现来探索冶金的历史背景。

本书中论述的很多实验结果都是由他本人作出的，很多精心制作和清晰的金相图也是在他的实验室中完成的。

田教授的这本技术史是面向实际的。冶铸工作者可以从本书中学到许多古代工艺师的非凡技能，社会科学工作者可以学到古代中国的特征，这些特征和文学以及哲学方面的特征一样的重要。此外，田教授还在本书中补充了对古代金属制品的鉴别、非破坏性试验和保存方面的知识，这无疑对考古学家和博物馆工作人员是有价值的。

对田教授在材料科学史上令人佩服的贡献是值得祝贺的。我很乐意借此表达我的祝贺。

PREFACE

In recent years the history of science has become a discipline, with thousands of practitioners around the world, over a hundred academic departments, and a great many learned societies. It has attained this importance because, as science and technology continue to grow, it becomes increasingly urgent to reflect critically on their past in order wisely to shape their future. As the cost of development continues to grow, even the richest countries can no longer afford to waste their resources by making the same mistakes again and again. In some parts of the world, modernization has done great violence to traditional culture, while in others, old and new now enrich each other. comparative studies of technological and social change in diff-

erent circumstances offer developing nations an opportunity to choose the most desirable path.

The steady contributions of Chinese historians for over half a century, and more recent writings of foreign scholars who have spread knowledge of this field throughout the world, have made the study of Chinese science, technology, and medicine an important part of the history of science.

Educated people everywhere now realize the scientific and Industrial Revolutions were the culmination of discoveries and inventions made in every part of the world. These revolutions became possible only because ideas and methods flowed freely into Europe from China, Islam, and India, especially during the Renaissance. We now realize that the free flow of ideas between China and Europe was an important condition for the rapid growth of the West.

Among the specialties that have formed within the history of science, one of the most vital is archeological metallurgy. This field is concerned with discovering the processes by which ancient metals and metallic artifacts were made. Because of the great sophistication of early Chinese metal working, its products have been important objects of study from the beginning. Foreign experts in archeological metallurgy—Noel Barnard in Australia, Cyril Stanley Smith, Robert Maddin, and Michael Notis in the United States—have for the past decade maintained close contact with leading

Chinese workers such as 田长浒, 柯俊, and 华觉明. The laboratories of these and other countries have shared problems and solutions. For some time a general historical survey of early Chinese metallurgy has been badly needed to convey the present state of understanding. In the past two years Prof. Ke and Hua have edited collections of papers which capably summarize recent research in certain areas. Prof. Tian has now provided a comprehensive history. It has two great merits. First, it faithfully synthesizes the results of work by many scholars. Second, it reveals the thought of prof. Tian himself. He is very learned scholar, experienced in laboratory research, who combines clarity of exposition with a deeply inquiring mind.

This is a history of all the classical metals, with special attention to bronze and iron. It covers metallurgical processes from mining to annealing. Prof. Tian is concerned with agriculture, military, and other uses of metals. His work is not only technical. It explores the historical background of metallurgy, using the rich written record as well as the discoveries of archeologists. Much of the laboratory work described in this book is his own. The carefully planned and clearly executed metallographs were made in his laboratory

prof. Tian's history is practically oriented. Every metallurgist can learn from it a great deal about the unparalleled accomplishments of ancient craftsmen. Humanists can learn about characteristics of old China that

are an important as in literature and philosophy, what is more, Prof. Tian has enriched this book with discussions of authentication, non-destructive testing, and preservation of ancient artifacts, that will be valuable to archeologists and museum workers.

Professor Tian deserves contratulations for his impressive contribution to the history of materials science. It is a great pleasure to convey my congratulation in this form.

N. SiviN
profess or of Chinese Culture and
The History of Science
University of Pennsylvania
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THE TECHNICAL HISTORY
OF ANCIENT
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