YENCHING SERIES 燕京大學叢書

英文物理學原理及其應用

PRINCIPLES OF PHYSICS AND THEIR MODERN APPLICATIONS

BY

CHARLES H. CORBETT
YENCHING UNIVERSITY, PEKING

AND

YÜ-MING HSIEH

THE COMMERCIAL PRESS, LIMITED
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FOREWORD

I have examined with interest and appreciation the "Principles of Physics and Their Modern Applications" by Professors Corbett and Hsieh. The book in my judgment marks a notable advance in the presentation of the subject of physical science. It is educationally sound and advanced. Instead of beginning with abstract principles and remote facts which leave the student with the impression that natural science deals with technical matters significant only in the laboratory, it begins with operations and facts which are already familiar in a practical way at least to students. Then it enables them to understand these facts and their laws and to use them intelligently. It follows an experimental method and the method of personal observation and discovery. The observations and experiments relate to life and the student's own social environment instead of to far-away matters. I believe the method which the authors have so successfully employed in their text would, if it were generally adopted, bring about *in any country* a much higher order of general intelligence, and closer connection between learning, knowledge and life. It seems to be peculiarly adapted to the intellectual and social needs of China at the present time. I congratulate the authors and the educational public on this admirable achievement.

JOHN DEWEY.

COLUMBIA UNIVERSITY,
NEW YORK CITY.

PREFACE

This book has been written especially for Chinese students. It has therefore a Chinese background and introduces many illustrations of physical facts from Chinese life. In addition it explains many of the newer inventions which are now coming into use in China, or which could advantageously be introduced. It aims thus to help the student to understand his environment and at the same time to feel at home in the modern world.

The order of topics is different from that which is customary in physics books. Instead of dividing the subject rigidly into mechanics, heat, sound, light, and electricity, a *social approach* to the subject is made and the work falls into five divisions as follows: (1) *Transportation and Communication,* (2) *Water Supply and Water Power,* (3) *Adapting Ourselves to the Weather,* (4) *Aids to the Eye,* (5) *Music and Games.* In this way it is possible to make use of the natural interests of the student more easily. It is not essential that the teacher follow the order in which the book is printed. If he finds it suits the interest of the student better to begin with Part II, or Part III, or Part IV, he can do so without difficulty.

The method followed in the book is first to try to interest the student in a problem in his environment and then to give him the physical laws necessary to explain this problem. All the aspects in which the student is likely to be interested, are taken up in the same chapter, whereas if the customary order of topics were followed it would be necessary to divide up the subject and postpone some aspects till a later time, thus losing much of the interest. In this book the attempt is made to use the laws of physics to explain the conditions of human life, rather than to use life to explain physics.

The practical questions and problems which follow each chapter have been carefully chosen and many which involve the use of Chinese weights and measures are used. The metric and English systems are also used so that students who are going on to scientific work or engineering, will not be at a disadvantage through unfamiliarity with the units employed in their professional work. Each group of problems

has a distinct unity because it deals with a single subject under various aspects, and this makes it easier to get the student's attention. It is hoped that the summaries will be found useful for reviews.

This course has been worked out in China in connection with classes of Chinese students and embodies the experience of a number of years of teaching. The authors are aware, however, that the work is far from perfect and they will cordially welcome corrections of mistakes and suggestions for improvement. They gratefully acknowledge suggestions already received from Professor John Dewey, of Columbia University; Professor George R. Twiss, of Ohio State University; Mr. R. E. McFalls, of the Baldwin Locomotive Works; and Mr. John Earl Baker, adviser to the Chinese Ministry of Communications.

CHARLES H. CORBETT.
YÜ-MING HSIEH.

YENCHING UNIVERSITY,
PEKING, June, 1925.

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THE PRINCIPLES OF PHYSICS AND THEIR MODERN APPLICATIONS

PART I. TRANSPORTATION AND COMMUNICATION

CHAPTER I

ADVANTAGES OF RAPID TRANSPORTATION AND COMMUNICATION

1. Introduction. We shall begin our studies with transportation and communication because here are some modern applications of physics which are of great importance to China to-day in promoting national unity and strength. In ancient times empires were built up and maintained with no swifter methods of travel than horses on land and ships propelled by sails or oars at sea, and with no more rapid means of communication than beacons lighted on the tops of mountains to announce the approach of an enemy But methods which were sufficient for an empire where the parts were held together by the power of the ruler, are quite inadequate for a great republic where the people govern themselves and decide their own affairs. For, when communication is slow, unity of action in a large country becomes difficult if not impossible, and the nation is weakened by sectional differences. The republics of ancient times were comparatively small, because large republics could not exist. The great, strong, and unified modern republics are made possible by the modern methods of rapid transportation and communication.

2. Changes Effected by Improved Transportation and Communication. Modern methods of transportation and communication have only recently been introduced into China but already they are effecting great changes. Telegraphs now form a network all over China, and if an earthquake or a typhoon occurs in one province, the fact is at once telegraphed to all the other provinces, and printed in the newspapers, and the railroads and steamships are soon bringing relief. Formerly one part of the country might be suffering from famine while other parts had an abundant harvest, yet transportation was so slow that grain could not be moved

quickly enough to save the starving people. Now the railroads have changed these conditions and famines are no longer as serious as they used to be. The people of the different provinces take much more interest in each other than they used to do, and there is a growing sense of national unity, and a developing public opinion.

3. Travel and Patriotism. China is a country of broad plains, stately rivers, lofty mountains, extensive plateaus, magnificent gorges, beautiful lakes, and many other notable natural features of great scenic value. There are also many splendid relics of the past such as the Great Wall, the tombs of the sages, the palaces of the emperors, and countless temples, pagodas, and arches which possess great historic interest. In the past the number of persons who could visit and enjoy these scenes was comparatively small, but as travel increases, these will be more and more appreciated. They will be visited more frequently, and will be pictured and described till every school child knows about them and feels that they are part of his national heritage. Travel will thus become a means of developing patriotism, and of helping people to appreciate the greatness of their country.

4. Unity of Language. When travelers were few, it did not matter much that the people of the south and those of the north could not understand each other when they talked, but now that travel is more convenient and rapid, many people are passing to and fro, and they are finding these differences of dialect intolerable. So efforts are being made to get a common language that will be understood in every part of the republic, and this will still further help to develop national unity and strength.

5. Uniform Currency. The reform of the currency is another change which has been made necessary by improved means of transportation. Formerly when a man started out to travel in China he took his money with him in the form of silver ingots which had to be cut in pieces and weighed when a purchase was made. This was very inconvenient, especially because each place had a different standard of weight. With the increase of the volume of travel, silver dollars came into use in China and these were much more convenient than silver ingots, but travelers still suffered a great deal of annoyance because there were so many different kinds of dollars and those which were preferred in one province were not wanted in another. Hence there arose a demand for a uniform currency that would be accepted anywhere in the republic, and that demand is being met by the new silver coinage.