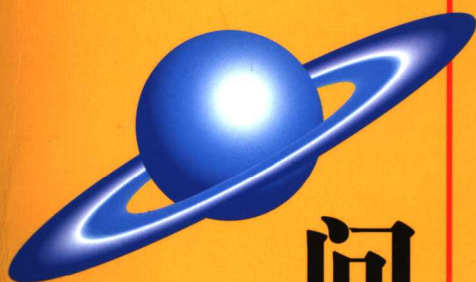


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编写

高峰 译

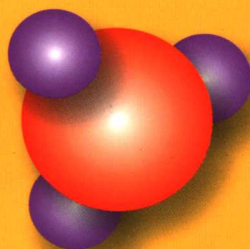


# 问答手册

# 科技知识

# 简明

THE  
HANDY  
SCIENCE  
ANSWER  
BOOK



清华大学出版社

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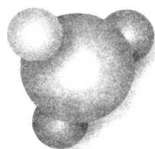


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北京

This edition is adapted from the original THE HANDY SCIENCE ANSWER BOOK,  
Second Edition.

THE HANDY SCIENCE ANSWER BOOK, Second Edition

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Ink Press, USA

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#### 图书在版编目(CIP)数据

简明科技知识问答手册 / 美国卡内基图书馆科技部编;高峰译. —北京:清华  
大学出版社,2005.4

书名原文: The Handy Science Answer Book

ISBN 7-302-10624-X

I. 简… II. ①美… ②高… III. 科学技术—问答—汉、英 IV. N49

中国版本图书馆 CIP 数据核字(2005)第 017903 号

出 版 者: 清华大学出版社

<http://www.tup.com.cn>

社 总 机: 010-62770175

地 址: 北京清华大学学研大厦

邮 编: 100084

客户服务: 010-62776969

责任编辑: 向 璐 蔡心奕

印 刷 者: 北京季蜂印刷有限公司

装 订 者: 三河市春园印刷有限公司

发 行 者: 新华书店总店北京发行所

开 本: 148×210 印 张: 23.375 字 数: 819 千字

版 次: 2005 年 4 月第 1 版 2005 年 4 月第 1 次印刷

书 号: ISBN 7-302-10624-X/H·638

印 数: 1~4000

定 价: 48.00 元

# 出版前言

这是一本由美国 Visible Ink 出版社引进、关于自然和科学技术知识的全面而经典的问答手册,适合具有高中以上英文水平的读者阅读。是读者提高自身科技英语水平,丰富自然与科技知识的最佳选择之一。

作为本书的作者,美国宾西法尼亚州匹兹堡市的卡内基图书馆的科技部门人员每年都会收到来自各种渠道的 11 万余条有关自然与科技方面的询问。作者从这些问题中精选出人们最关注的与生活息息相关的最新科技问题 1400 余条,以极其严谨的态度,将其按照物理和化学、空间、地球、气候和天气、矿物、能源、环境、生物、植物、动物、人体、健康与药物、度量、工具和武器、建筑与桥梁、交通工具、交流方式、普通科技等分类,通过查阅权威的资料,一一认真做答并结集出版。

该手册内容全面而详尽,由于选材贴近生活,并不是源自高深的纯理论科学,所以读者可以在轻松愉快的阅读心情中深入了解各种神秘自然现象与自然规律背后的原因,以及人类几千年辉煌的科技文明成就等诸多知识。为了方便中国读者的阅读,在原版引进此手册后,我们特意邀请中国专家在原版英文图书的基础上为每个问题添加了中文翻译,同时本手册附录中的 4000 余条中英对照的术语翻译更加方便了我国读者对本书的理解。相信本手册会让读者在英语学习与自然和科学技术知识方面同时受益。

清华大学出版社外语分社  
2005 年 3 月

# Introduction

## 引言

We live in an age of scientific and technological urgency, chatting on the Internet, cooking in microwave ovens, and keeping track of voice mail, E mail, and what we call “snail” mail when its delivery takes, say, a whole day or so. From the trivial to the complex, gizmos and whatchamacallits dominate modern life. Information whizzes by faster than a speeding bullet. Discoveries are made daily, hourly, by the minute. The horizons of knowledge are becoming mighty distant for many of us. That quizzical staring into space and idle scratching of the head are symptoms of the condition known as *information overload*. Though not life-threatening, it certainly is frustrating.

Wouldn't it be great if someone would just collect the answers to some of life's mysteries? Like, just what is a syzygy? Why is the sky blue? How deep is the ocean? What are PCBs? What is genetic engineering? When did the Ice Age begin? When did it end? Why do the hands on a clock go “clockwise”? Does rock music kill plants? Why do cats like catnip? Why do a Siamese cat's eyes glow red? How long do specific animals live? What is a male lobster called? How many miles of veins do I have? What is the purpose of goose-bumps? What is dead reckoning? Why don't the tires on an airplane blow out when the airplane lands? Why do AM radio stations have a wider broadcast range at night? How does that fax machine work? What is a computer “virus” and how is it spread? What do those lines in a Universal Product Code mean?

*The Handy Science Answer Book* is just such a collection. Each year, the staff of the Science and Technology Department at the Carnegie Library of Pittsburgh receives more than 111,000 reference questions and inquiries by the telephone, through the mail, and from personal in-house contact. Even though armed with 390,000 books, 425,000 bound periodicals, and thousands of government documents, technical reports, and microfiche, the Department finds that it requires a special file to answer these questions quickly and reliably. Some of this wealth of cumulative information has been in existence for at least 44 years—as far back as any of the current Carnegie staff can remember. It

may even date back to 1905, the year when the Carnegie Library of Pittsburgh became the first major public library in the United States to establish a separate Science and Technology Department. The gems from the ready reference file are shared with you in *The Handy Science Answer Book*.

This second edition of *Handy Science* provides answers to more than 1,400 unusual, interesting, or frequently asked questions in the areas of science, pseudo science, and technology. We've added more than 300 completely new questions, and updated and expanded hundreds more. In addition, 100 illustrations and many tables augment the text. In some ways, science touches so much of our lives—whether it be our environment, our homes, our workplaces, right down to our physical bodies themselves—that it can become difficult to categorize what actually constitutes science. *Handy Science* makes no particular effort to restrict the questions to pure science, but focuses on those questions that have achieved noteworthiness either through their popularity, the time-consuming nature of their research, or their uniqueness.

The Carnegie staff has verified figures and dates to the best of their ability. Keep in mind that even in science, figures can seem to be in conflict; many times such discrepancies may be attributable to the authority perspective, or more commonly, to the results of simple mathematical rounding of figures. Occasionally, the figure or date listed is a consensus of the consulted sources; other times the discrepancy is noted and alternatives given. *Handy Science* rounds off figures whenever it seems that such precision is unnecessary. When designating eras, *Handy Science* uses the abbreviation C. E. ("of the common era") instead of the more familiar A. D. (*anno Domini*, "in the year of the Lord"), and B. C. E. ("before the common era") in place of B. C. ("before Christ").

The answers are written in non-technical language and provide either a succinct response or a more elaborate explanation, depending on the nature of the question. Definitions to scientific terminology are given within the answer itself, and both metric and U. S. customary measurements are listed. Following the main Q&A section are suggestions for further reading (most of which were used to answer various questions) and the index.

So, when you're stuck wondering how, exactly, a chimney differs from a flue, or whether there's any bird that can fly upside down, or how dalmatians became firehouse dogs, reach for *Handy Science*. Or if you suddenly need to know the life span of a chimpanzee (51 years maximum) or the number of horses in the world (65,292,000) or how many muscles it takes to produce a smile (17) or a frown (43), reach for *Handy Science*. You'll find it downright handy.

# Acknowledgments

## 致谢

Many people have made significant contributions to the second edition of *The Handy Science Answer Book*. Margery Pepper gave her best performance ever during this revision project. She realized early on the scope and magnitude of the work and completed it with wisdom, insight, and professionalism. I especially appreciated her calmness when all our efforts seemed to be confirming Murphy's Law. Thanks, Marge. I want to thank the staff librarians in the Science and Technology Department for their sustained endeavors and words of encouragement. They include: Joan Anderson, Naomi Balaban, Aimee deChambeau, Janet Horsch, Susan Horvath, Marilyn Megahan, Blanche McManus, Dorothy Melamed, David Murdock, Gregory Pomrenke, Charles Quinn, and Donna Strawbridge.

Mary Shields did a great job of preparing every question from handwritten entry to final format on disk. She proofed every question, verified all citations, solved numerous problems relating to questions, and kept track of tens of thousands of photocopies.

Students in my "Science and Technology Resources and Services" classes at the University of Pittsburgh's School of Library and Information Science contributed some interesting and challenging questions over the last few years. Bob Wienand and Chuck Sabatos provided some difficult questions in chemistry that we're still trying to answer.

I thank Bob Croneberger, Loretta O'Brien, and Gladys Shapera Maharam, senior library administrators, at the Carnegie Library of Pittsburgh for their interest and encouragement.

In addition, I've enjoyed working with science editor Bridget Travers and appreciate her task of seeing this project to completion. At Visible Ink Press, thanks to senior editor Christa Brelin and to Mikal Ansari, Randy Bassett, Jim Craddock, Buffy May Fairchild, Pam Hayes, Shanna Heilveil, David Kunath, Bryan Lassner, Evi Seoud, Devra Sladics, Kim Smilay, and Sue Stefani. For fine proofreading, thank you Sharon Remington; for fetching design, thanks Mary

Krzewinski; and for excellent typesetting, thanks Marco Di Vita of the Graphix Group.

Finally, thanks to my wife, Sandi, and sons, Andrew and Michael, for their encouragement, patience, and understanding—especially when I was late for dinner.

*James E. Bobick*  
*Head, Science and Technology Department*  
*Carnegie Library of Pittsburgh*



# Credits

## 致谢名单

Line art illustrations by Hans & Cassady of Westerville, Ohio.

Photographs of nine-banded armadillo, monarch butterfly, sundew, and Grand Canyon National Park provided by Robert J. Huffman/Field Mark Publications. Additional photographs provided by the Library of Congress, the National Aeronautics and Space Administration, the National Park Service, the U.S. Department of Agriculture, and the U.S. Fish and Wildlife Service.

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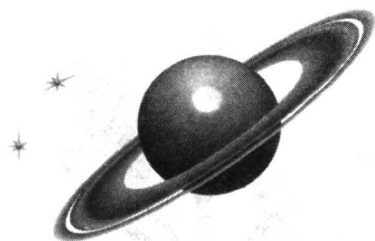
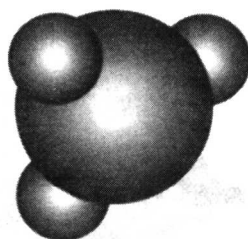
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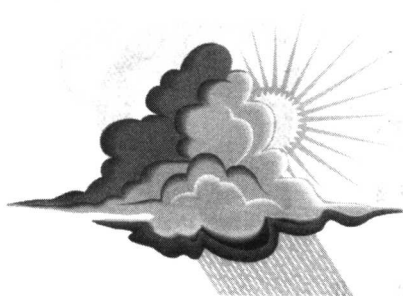
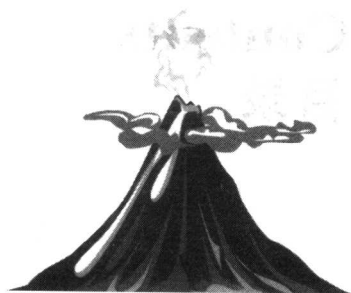
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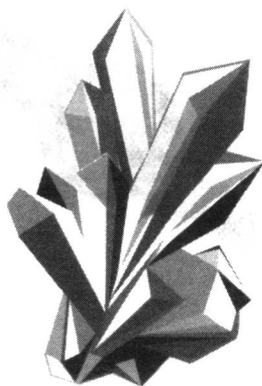
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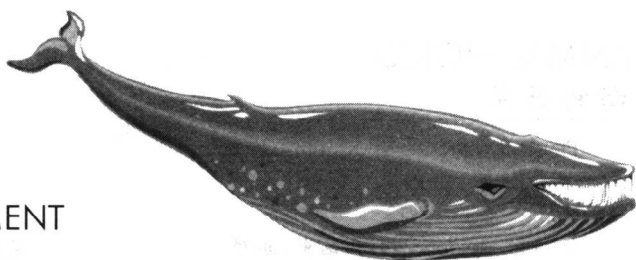
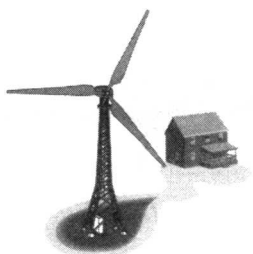
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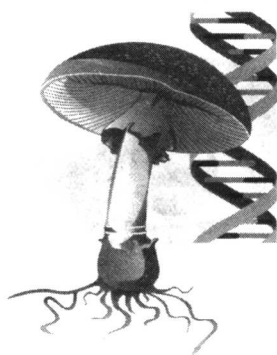
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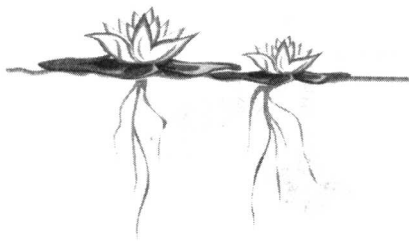
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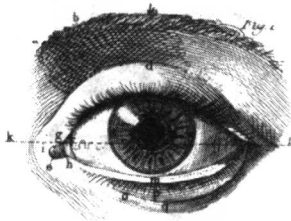
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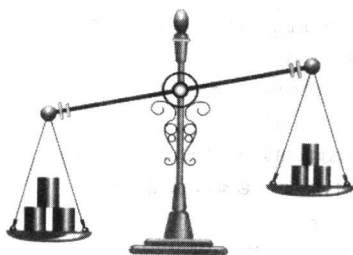
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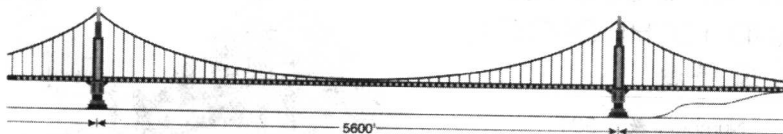
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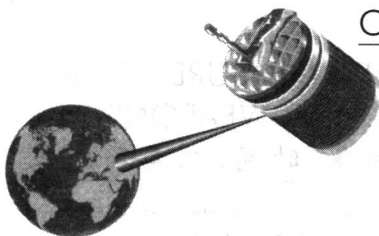
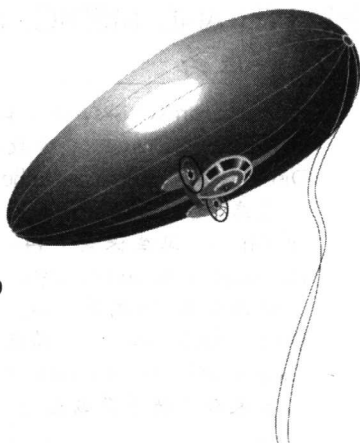
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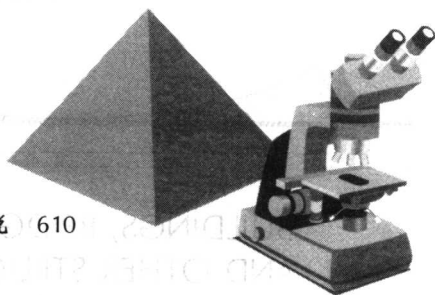


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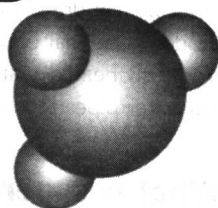
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# PHYSICS AND CHEMISTRY

## 物理和化学



ENERGY, MOTION, FORCE, AND HEAT  
能量, 运动, 力和热

*see also: Energy*

参见: 能量

### How is “absolute zero” defined?

“绝对零度”的定义是什么?

Absolute zero is the theoretical temperature at which all substances have zero thermal energy. Originally conceived as the temperature at which an ideal gas at constant pressure would contract to zero volume, absolute zero is of great significance in thermodynamics and is used as the fixed point for absolute temperature scales. Absolute zero is equivalent to  $0^{\circ}\text{K}$ ,  $-459.67^{\circ}\text{F}$ , or  $-273.15^{\circ}\text{C}$ .

The velocity of a substance's molecules determines its temperature; the faster the molecules move, the more volume they require, and the higher the temperature becomes. The lowest actual temperature ever reached was two-billionth of a degree above absolute zero ( $2 \times 10^{-9}\text{K}$ ) by a team at the Low Temperature Laboratory in the Helsinki University of Technology, Finland, in October, 1989.

### Does hot water freeze faster than cold?

热水比冷水结冰快吗?

A bucket of hot water will not freeze faster than a bucket of cold water. How-



ever, a bucket of water that *has been* heated or boiled, then allowed to cool to the same temperature as the bucket of cold water, may freeze faster. Heating or boiling drives out some of the air bubbles in water; because air bubbles cut down thermal conductivity, they can inhibit freezing. For the same reason, previously heated water forms denser ice than *unheated* water, which is why hot-water pipes tend to burst before cold-water pipes.

## What is superconductivity?

什么是超导[电]性?

Superconductivity is a condition in which many metals, alloys, organic compounds, and ceramics conduct electricity without resistance, usually at low temperatures. Heinke Kamerlingh Omnes, a Dutch physicist, discovered superconductivity in 1911, but it was not until 1972 that the modern theory regarding the phenomenon was developed by three American physicists—John Bardeen, Leon N. Cooper, and John Robert Schrieffer. Known as the *BCS theory* after the three scientists, it postulates that superconductivity occurs in certain materials because the electrons in them, rather than remaining free to collide with imperfections and scatter, form pairs that can flow easily around imperfections and do not lose their energy. A variety of uses have been proposed for this phenomenon, including switching devices that control electronic circuits in computers; devices that measure extremely small magnetic fields for medical diagnosis; and the means to develop powerful superconducting magnets used to build particle accelerators.

## What is inertia?

什么是惯性?

Inertia is a tendency of all objects and matter in the universe to stay still, or if moving, to continue moving in the same direction, unless acted on by some outside force. This forms the first law of motion formulated by Isaac Newton (1642 – 1727). To move a body at rest, enough external force must be used to overcome the object's inertia; the larger the object is, the more force is required to move it. In his *Philosophiae Naturalis Principia Mathematica*, published in 1687, Newton sets forth all three laws of motion. Newton's second law is that the force to move a body is equal to its mass times its acceleration ( $F = MA$ ), and the third law states that for every action there is an equal and opposite reaction.